the OIL AND GAS JOURNAL

FEBRUARY 20, 1956

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Some are calling it "jackpot geology"

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It's reducing costs in an Oklahoma field

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# UNIT RIG

# U-40

## UNIT RIG U-40 draw works selected for world's LARGEST portable rig!

*Pictured above is the standard, double drum model U-40 Draw Works selected for the World's Largest Portable Rig, for operation in Venezuela.*

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# A glance ahead . . . at press time

## These trends will make TOMORROW'S NEWS

**Atomic energy will be harnessed for industrial use quickly.** But it will be a long time before thermo-nuclear energy will be controlled.

Thermo-nuclear energy is what makes the hydrogen bomb. It takes a temperature as hot as the sun to release it. The cost of producing that heat is so great that results wouldn't pay for it now, even if anyone had any idea how to do it.

**Treasury views on the depletion allowance** will go to the Capitol within the next few weeks. Secretary Humphrey said last month that depletion is a desirable incentive to development of natural resources. But he has never disclosed whether he thinks the rate should be reduced.

**The butadiene plant at Louisville, Ky.,** last fragment of the Government's synthetic rubber industry, may be put up for sale or long-term lease this year.

Publicker Industries still has 2 years to go on its 3-year lease. But it is planning expansion of the plant, if it can get it outright or for a long term. Like the Baytown, Tex., and Institute, W. Va., plants, the Louisville facility couldn't be sold on the first go-round. A bill in Congress would permit another try.

**Partial or complete reversal of product shipments** in the Trans-Northern product line from Montreal to Toronto may be coming soon.

The reasons: Assured expansion of refineries in the Toronto area and increased product shipments from Sarnia refineries. Still undecided is whether it will be economic, and otherwise desirable, to extend the Interprovincial crude line from Sarnia to Montreal and thereby supplant imports with crude from the western provinces.

**There's a lot of talk about new processes** for raising octanes, but many refiners are doing well with their original cat reformers. Of the 96 Platforming units in operation, 10 to 15 are making 90 research octane clear. Some are putting out 100-plus reformate, with lead.

Reforming, now undergoing a second round of construction in many refineries, is authoritatively projected to reach 250,000 bbl. per day in total U. S. capacity by 1965. Of this, roughly 190,000 bbl. per day is expected to be in operation by the end of 1960.

**Look for an announcement about March 1** concerning the rumored merger of Gulf Oil Corp. and British American Oil Co., Ltd.

**Natural gasoline manufacturers** are facing the necessity of processing their product in order to sell it to refiners.

Isopentane separation, isomerization of normal pentane, catalytic reforming of hexanes and heavier are all in the future for these operators. At least six isomerization processes are now available or shortly will be available for both refiners and natural gasoline manufacturers to pick for the next round in making high-octane motor fuels.

The OIL AND GAS JOURNAL

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
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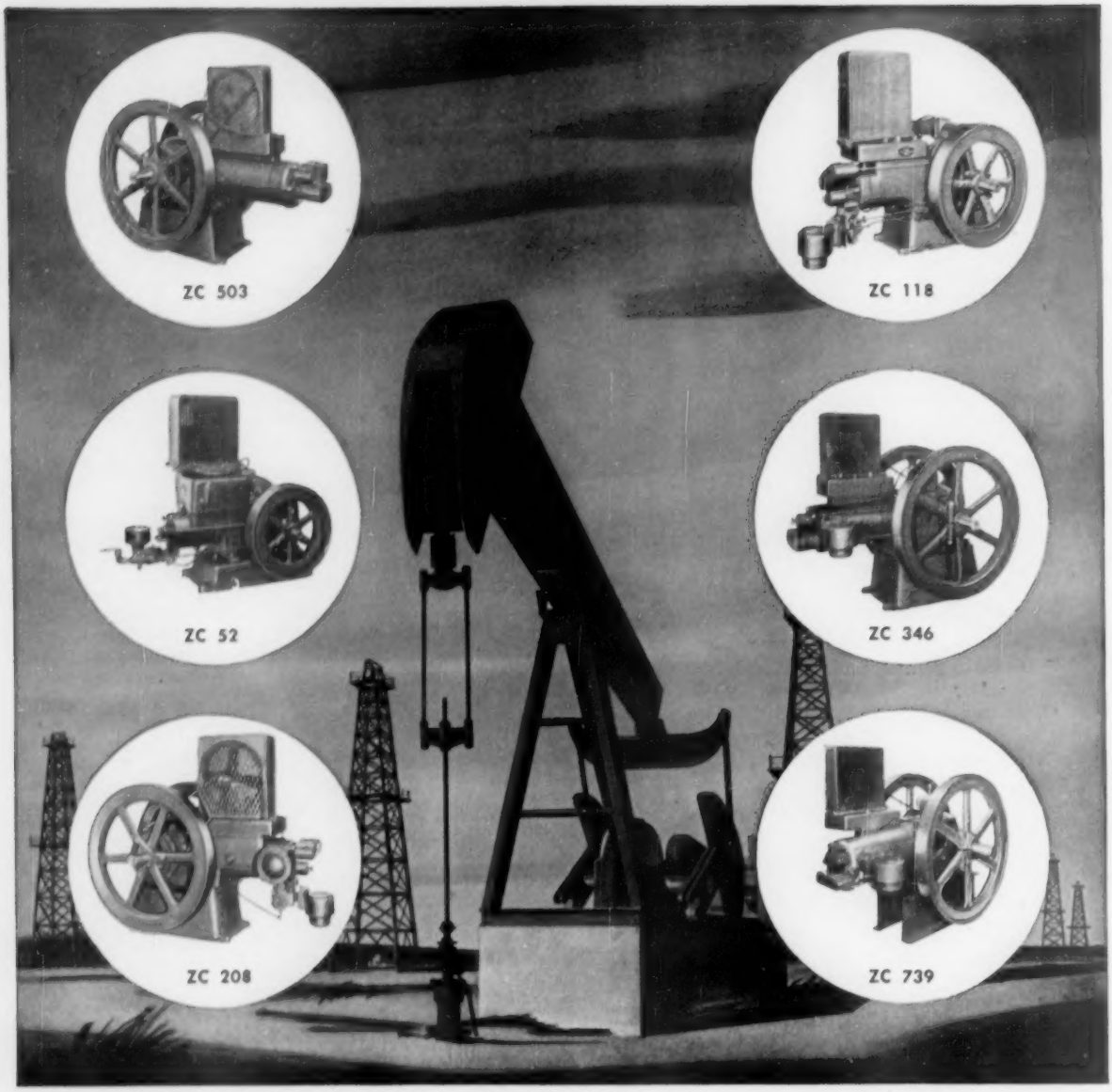


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# *Unsuspected* copper may be causing your gasoline to form GUM

When your gasoline leaves the refinery, it may not contain a trace of copper . . .

But pump-island surveys show that most gasolines pick up some copper before they reach your customers' car tanks. And copper in concentrations of less than one part per million can catalyze the gum-forming reactions to a harmful level. One Du Pont gasoline quality survey, for example, disclosed significant amounts of copper present in 91% of 241 gasoline samples from representative service stations in the U.S. and Canada. And the gasolines known to contain no metal deactivator were found to be high in gum content.

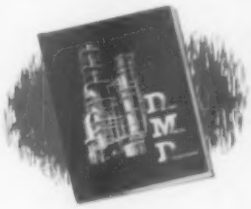
The results of this survey indicate clearly that, in spite of the great pains taken to prevent copper contamination during refinery operation, copper is getting into the majority of gasolines sold. How? . . . Probably from contact with valves, pumps and other sources in the distribution system.

**You CAN control it**

Only about 1 pound of Du Pont Metal Deactivator (DMD) per 1000 barrels is needed to safeguard your gasolines against the harmful effects of copper. And in this low concentration, it costs you less than ⅛ of a cent per barrel to get this effective and important quality insurance.

**DU PONT METAL DEACTIVATOR** also has valuable applications in kerosines, jet and diesel fuels, furnace and turbine oils.

Ask for a sample and prove to yourself its effectiveness. Or ask one of our regional laboratories to evaluate it for you, in your own stocks. Just address your request for this service to the nearest sales office listed below.




**Write for booklet**—All of the properties, uses and methods of addition of DMD are discussed in this booklet. If you do not already have a copy, ask any of our representatives or sales offices to send you one.

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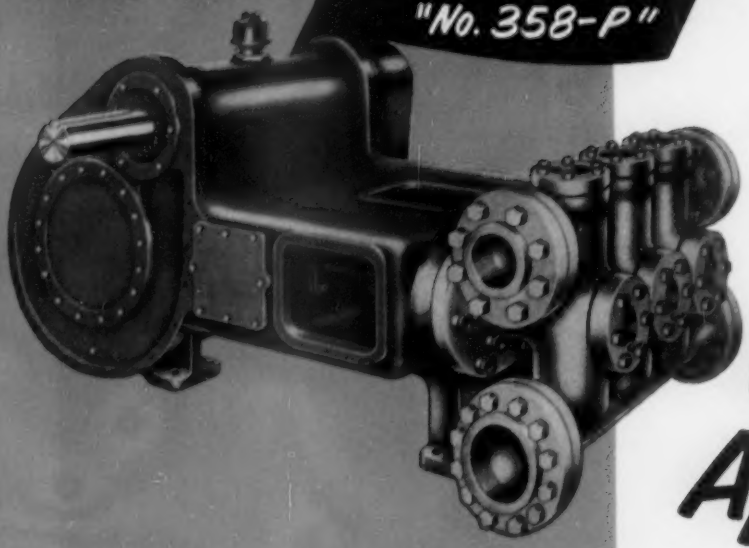
# This New 8" Stroke "No. 358-P" Plunger Pump extends the "Oilwell" Line for Waterflood Applications



**WHEN YOUR WATERFLOOD PLANS** call for larger-volume high-pressure injection, it will pay you to investigate the economies of installing fewer "Oilwell" No. 358-P Triplex Plunger Pumps instead of a greater number of smaller units.

This new 8-inch stroke size, like the time-proven 4-inch and 6-inch stroke units, is designed with reduction gear, to provide the pressure-volume desired at slower operating speeds and with a wider selection of prime movers.

With this design, slower plunger speeds with fewer reversals result in less wear on packing, plungers, crossheads and all moving parts including valve service. And, horizontal heavy-duty construction means minimum suction-head requirements, less piping vibration and greater accessibility.

**DISPLACEMENT AND HORSEPOWER REQUIREMENTS**

| Plunger Size Inches | Maximum Working Pressure psi | NO. 358-P DISPLACEMENT Barrels per 24 hours at Pump Speeds (rpm) of: 75 | 100 | 125 | 150 |
|---|---|---|---|---|---|
| 3¼" | 2,410 | 2,210 | 2,950 | 3,680 | 4,430 |
| 3½" | 2,080 | 2,570 | 3,430 | 4,290 | 5,145 |
| 4" | 1,590 | 3,330 | 4,460 | 5,550 | 6,680 |
| 4½" | 1,260 | 4,250 | 5,655 | 7,060 | 8,460 |
| 5" | 1,020 | 4,870 | 7,000 | 8,740 | 10,500 |
| Pinion Shaft RPM Gear Ratio 4.05:1 | | 304 | 405 | 506 | 607 |
| BHP Required | | 107 | 142 | 178 | 214 |

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**(2)** Each stuffing box is removable through the frame cradle for replacement should this become necessary.

**(3)** Two-piece plunger-and-shank assemblies permit changing of plunger sizes without disturbing the power end and allows use of uncut packing rings.

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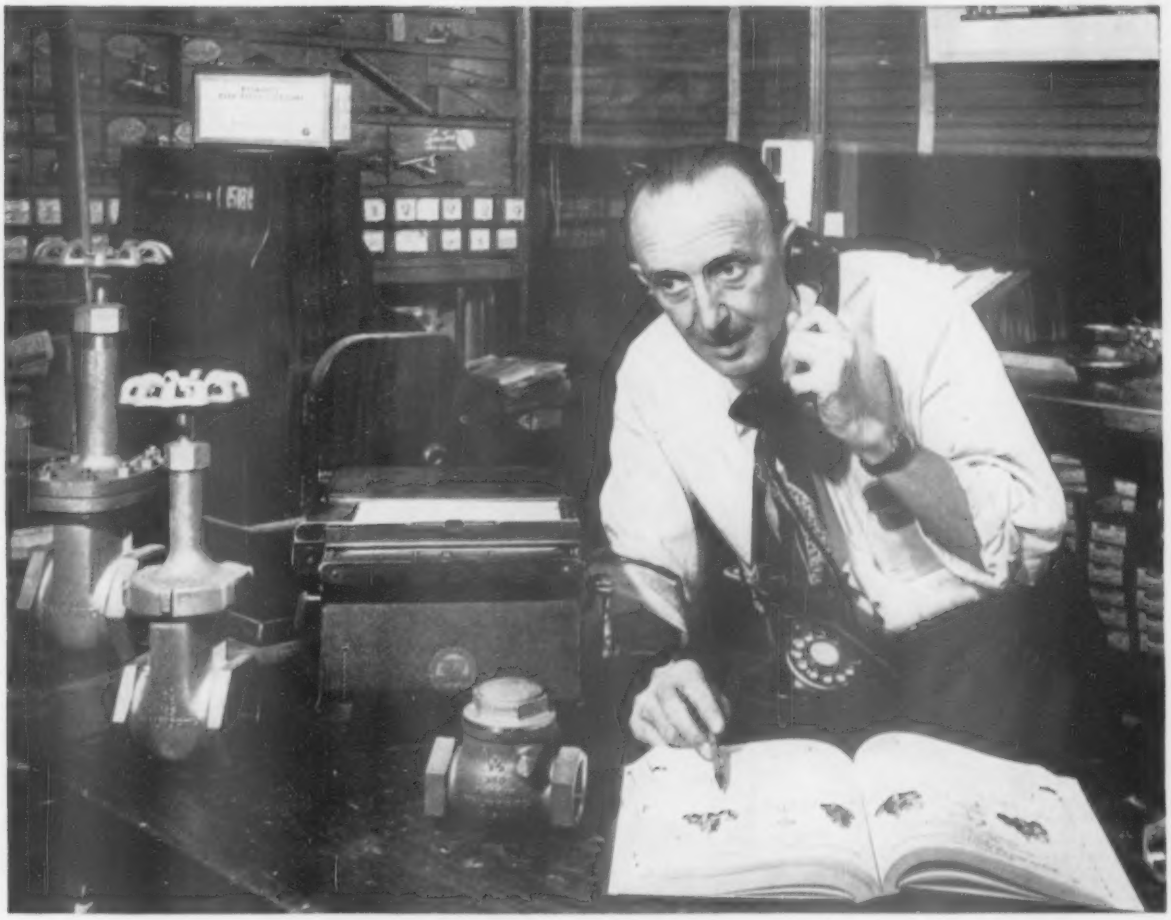

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# NEW

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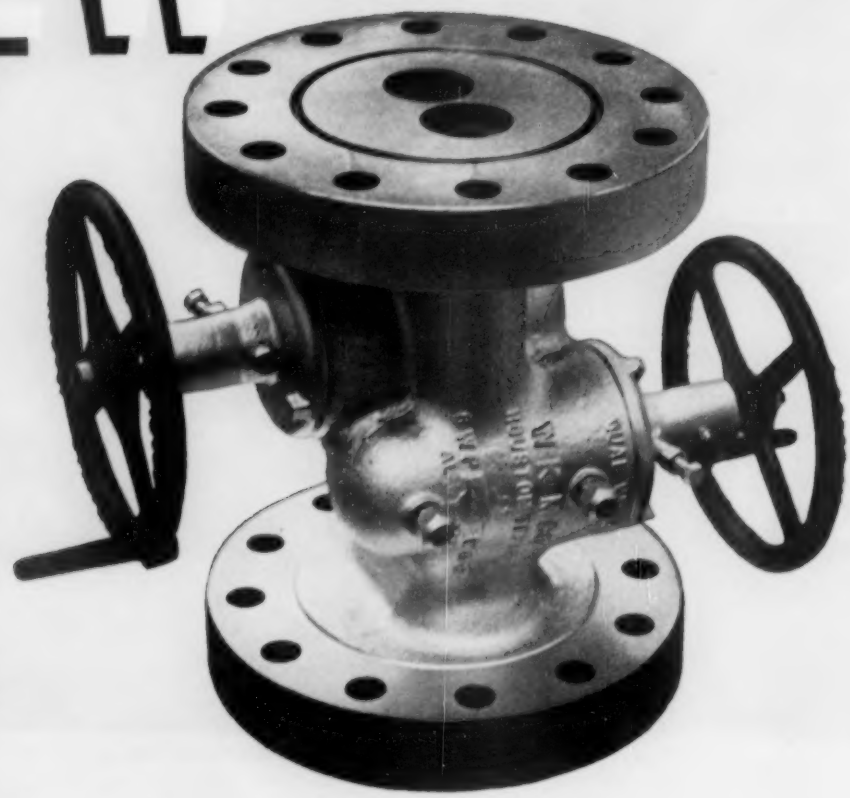

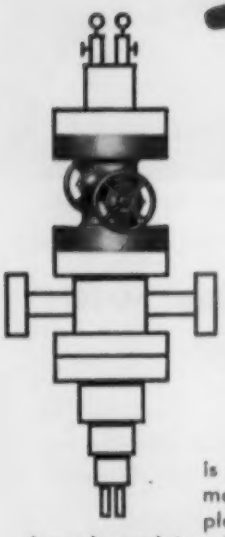

# NEW W-K-M DUAL VALVE

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All the valve parts are standard and interchangeable with W-K-M Valves of the same size, and both valves have all the advantages of standard W-K-M Valves such as: Seal Ring Bonnet, Metal-to-Metal Seal, Complete Perfect Seal against Each Seat, and Smooth No-Turbulent Flow.

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W-K-M Valves

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The Model R provides constant support which is mathematically perfect for all positions of travel. This constancy of support is maintained throughout the full range of field adjustability. Needle bearings minimize friction.

Grinnell Constant-Supports are individually calibrated to support the exact load specified. All Model R Constant-Supports have a full 70 percentage points of field adjustability built into them. No less than 10% of this adjustability is allowed either side of calibration for plus or minus change in load. Field re-adjustments are easily made by turning a single load adjustment bolt.

Grinnell designs, manufactures, and distributes a complete line of pipe hangers and supports for every piping requirement. Grinnell maintains an experienced staff of engineers in the field — ready to assist you on the job with any piping problem.

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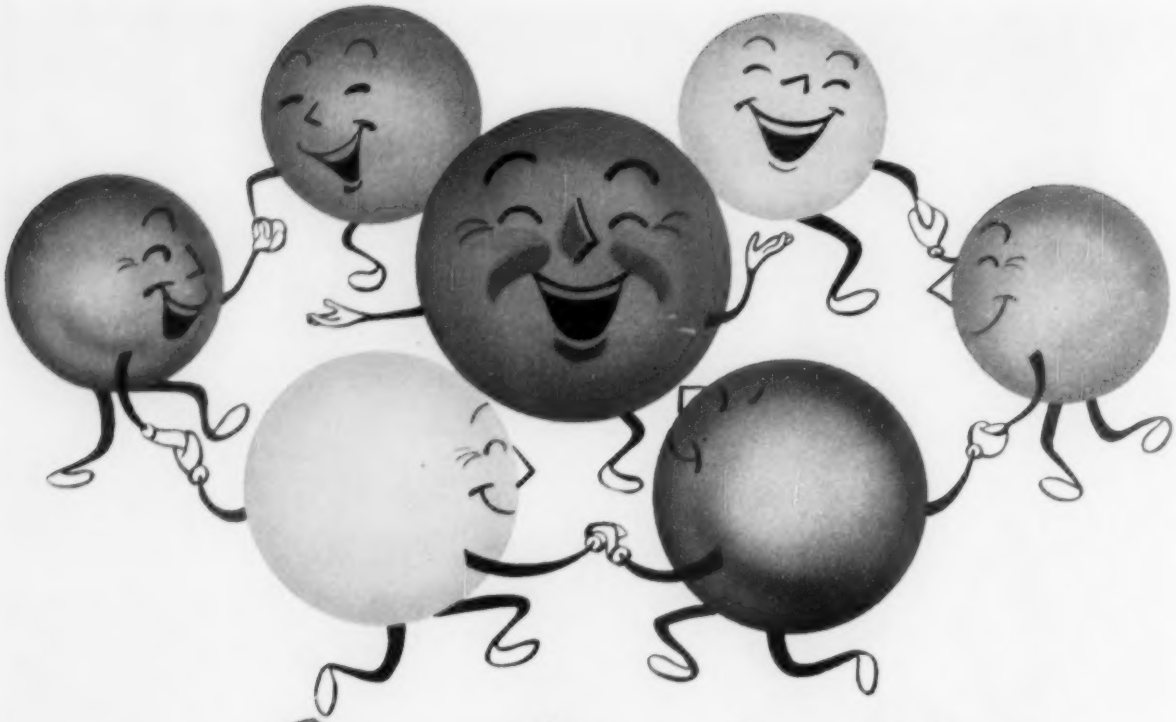

# Cozy Chemical!

When it comes to getting along in the chemical world, Chlorine is one of the leading "mixers," with the ability to step in among so many tight little molecular groupings. In some cases, Chlorine just nudges in among the atoms and makes room for itself. In others, it gets a little rougher, chasing away some atoms completely and preparing the way for the introduction of still other chemical pals.

This reactivity of Chlorine is the key to its diversified uses and to its inestimable value in the field of synthetic organic chemistry. Thousands of chemical processes are dependent upon Chlorine and its power to establish favorable conditions within a molecular structure for the manufacture of the end products desired.

Columbia-Southern, one of the nation's leading producers of Chlorine, has widespread facilities for serving industry from its plants in Barberton, Ohio; New Martinsville, West Virginia; Corpus Christi, Texas; Lake Charles, La.

## CHLORINE IS ESSENTIAL TO A MULTIPLICITY OF PRODUCTS

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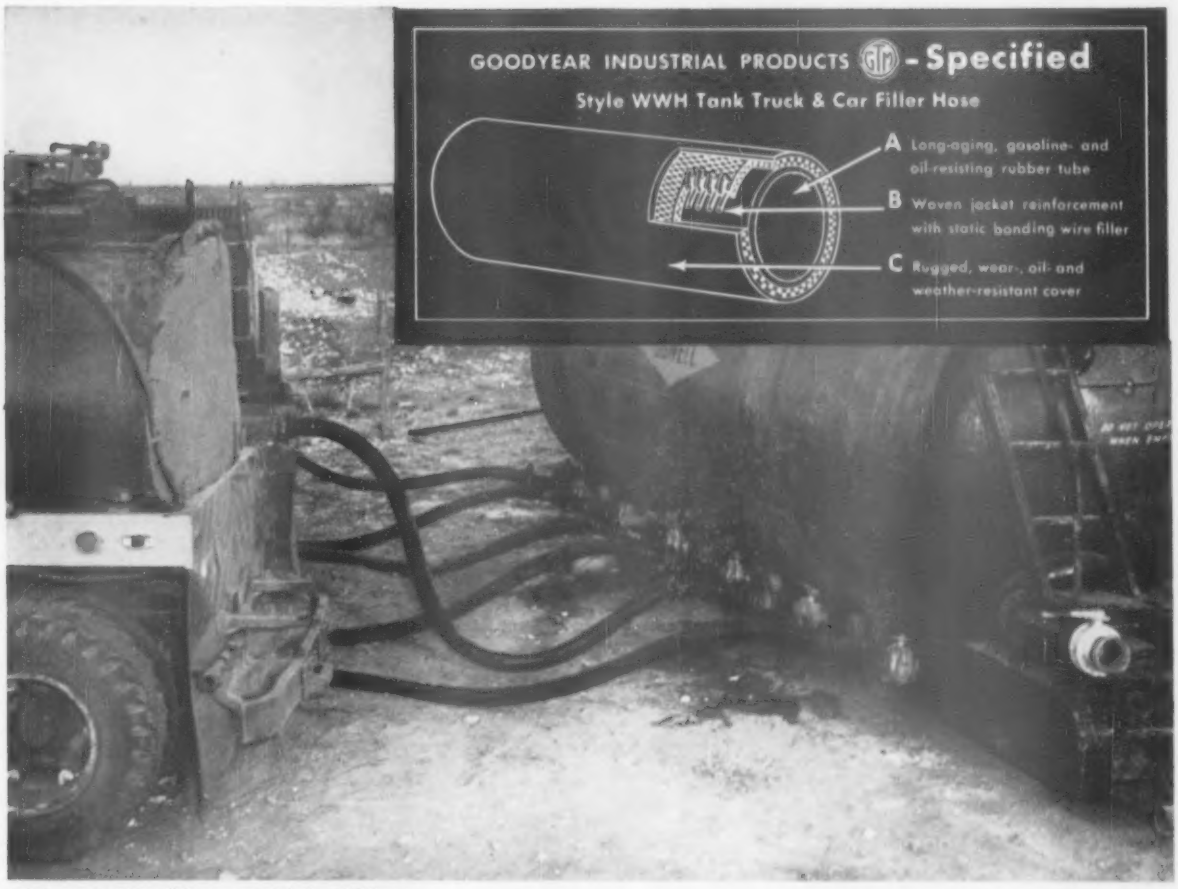

GOODYEAR INDUSTRIAL PRODUCTS GTM -Specified
Style WWH Tank Truck & Car Filler Hose
A Long-aging, gasoline- and oil-resisting rubber tube
B Woven jacket reinforcement with static bonding wire filler
C Rugged, wear-, oil- and weather-resistant cover

*Photo courtesy Dowell Incorporated, Tulsa, Oklahoma*

# The hose that props up tired wells

IN the Sprayberry Trend Area of West Texas, high-volume, high-injection-rate fracturing of low-producing wells is upping production by four to twelve times.

Developers of this rejuvenation process faced many problems in handling the quantities of oil/sand mixture required for increased penetration and "propping" of the fractures. Not the least of these was finding a hose that would safely and economically carry the fracturing fluid from trailer mixers to suction manifold to pump trucks. The G.T.M.—Goodyear Technical Man—was consulted. He specified Style WWH Tank Truck & Car Filler Hose (see blueprint) for the job.

**Result:** Together with a special well-head manifold and "down the casing" treatment, the trouble-free operation of Style WWH in this high-pressure, highly erosive service has permitted injection rates as high as 66 bbl. per minute. Wells formerly producing 25 bbl. or less per day are now yielding 100 to 300 bbl. daily.

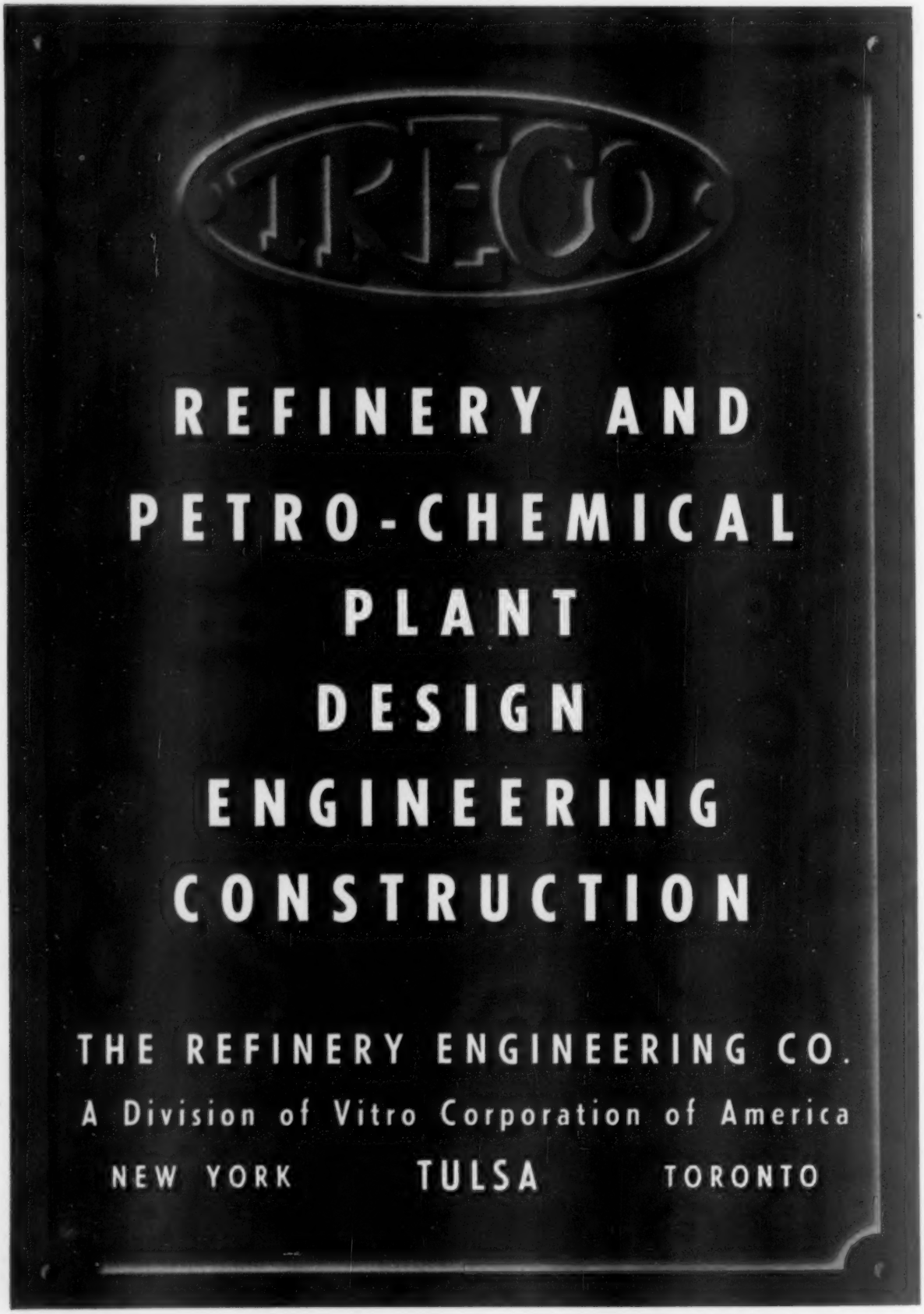
How can the G.T.M. help you with your hose problems? You can contact him through your Goodyear Distributor or by writing Goodyear, Industrial Products Division, Akron 16, Ohio.

**YOUR GOODYEAR DISTRIBUTOR** *can quickly supply you with Hose, Flat Belts, V-Belts, Packing or Rolls. Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

**STYLE WWH TANK TRUCK & CAR FILLER HOSE by**

**GOODYEAR**

**THE GREATEST NAME IN RUBBER**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# Want to improve gasoline quality and reduce treating costs?

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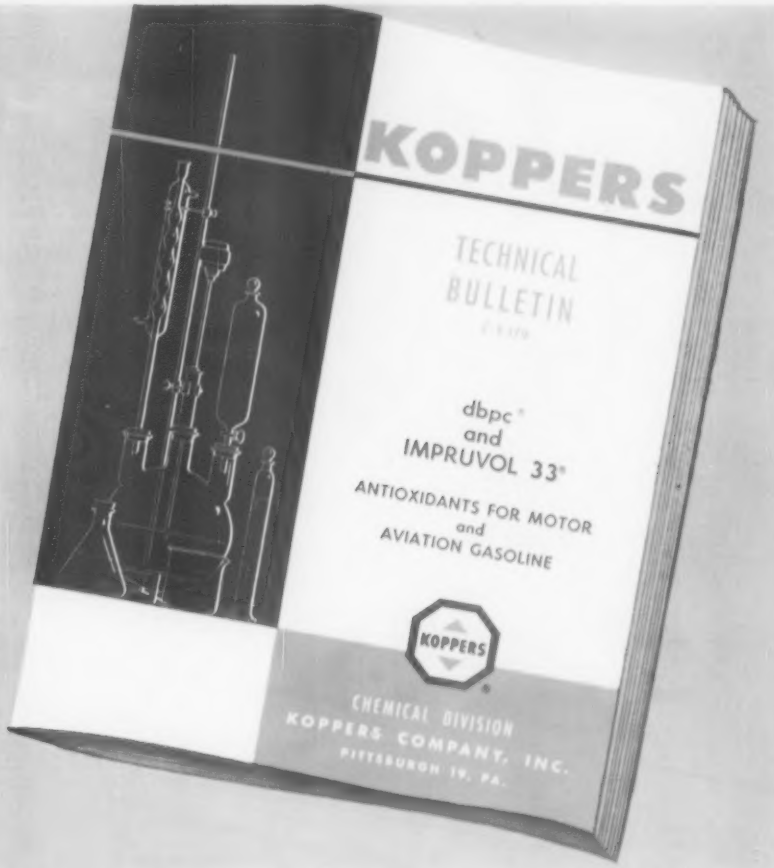


This new technical bulletin on **dbpc**® antioxidant (2,6 di-tertiary-butyl-para-cresol) was developed to help the refiner understand more fully the many factors which influence gasoline gum formation and automotive induction system deposits. Much of the data is dramatically revealed through newly designed laboratory equipment which is described in detail. And a new inhibiting practice is outlined for the refiner who wishes to improve gasoline quality while reducing treating costs.

Interesting charts, tables, and effectiveness graphs on **dbpc** antioxidant, in use and in storage, are contained in the bulletin. Furthermore, actual comparisons are made with different types of inhibitors to prove the efficiency and economy of **dbpc** antioxidant.

• • •

Send for your free copy of this factual, informative bulletin, today. Find out how you can make a better gasoline at less cost. Write to:

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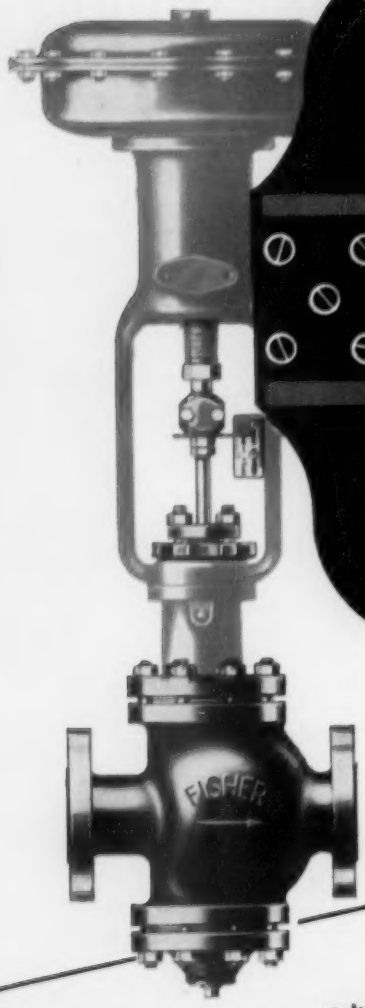
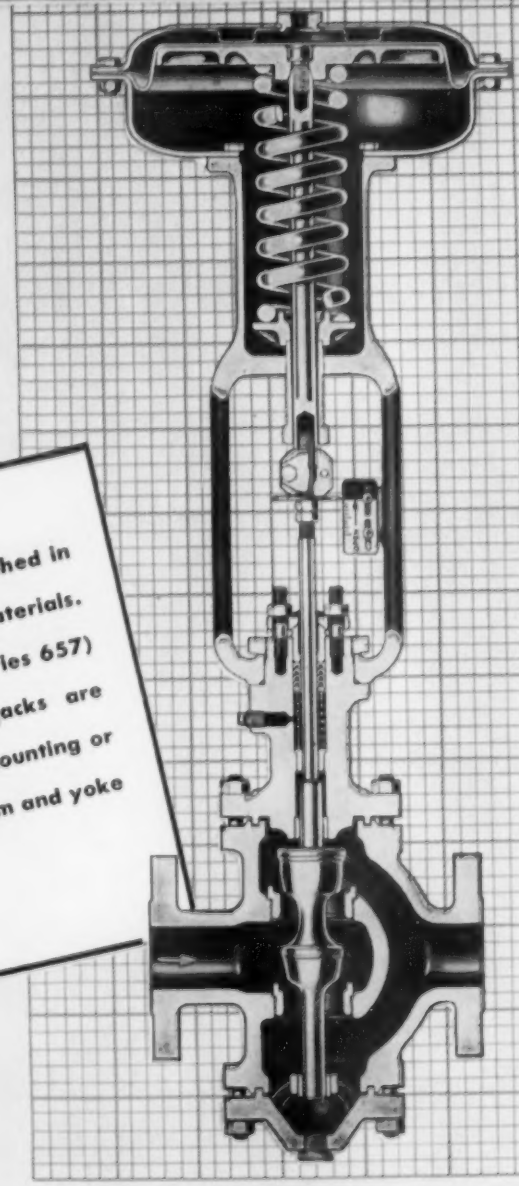
# DIAPHRAGM



● Fisher Diaphragm Motor Valves are furnished in a wide variety of pressure ratings and materials. Topworks may be either direct acting (Series 657) or reverse acting (Series 667). Handjacks are available for either diaphragm casing mounting or yoke mounting. There are six diaphragm and yoke size combinations.

# *Improved*

# MOTOR VALVES

## *Improved* PERFORMANCE FEATURES

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- Rugged body to yoke connection with hammer leg nut. Topwork can be removed without disturbing stuffing box.

- Specially designed Buna N molded diaphragms with Nylon insert retain superior flexibility at low ambient operating temperatures. Provides linearity between operating pressure signal and travel, and gives maximum effective area.

- Bolted gland stuffing box with Teflon packing.

- Stainless steel clear view travel indicator.

- Spring ranges: 3 to 15 psi; 6 to 30 psi.

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# HOW TO PREVENT *Crude Oil Corrosion*

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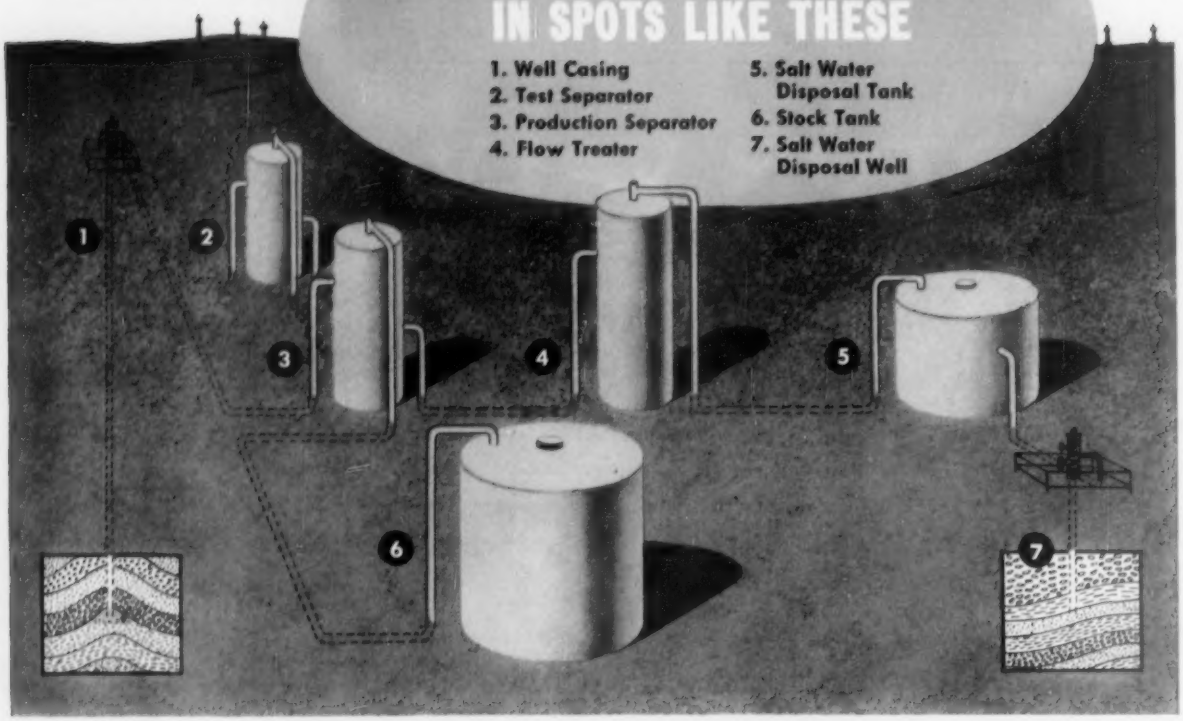


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Tarset is the toughest, hardest coating of its kind ever produced from coal tar. It will not shatter at −30°F. or soften at 400°F. It is superior to all other coal tar coatings in its ability to adhere to metal and concrete. And Tarset is easy to apply by brush, roller or spray.

If you have a corrosion problem—above ground or below—call on *Pittsburgh*. Without obligation, our engineers will gladly tackle your specific crude oil corrosion problem . . . and come up with dollar-saving answers. Let us hear from you today.

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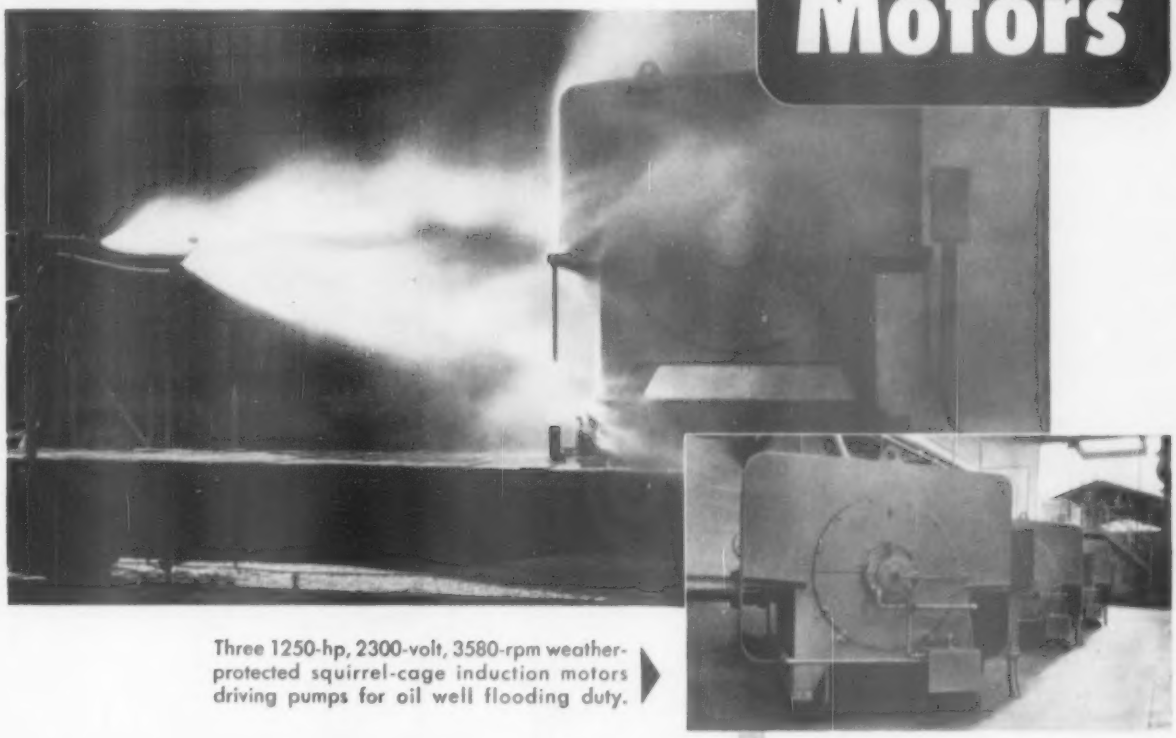
# For Positive All-Weather Protection

**Neither wind-driven rain nor sand could penetrate the baffled ventilating system of this Allis-Chalmers Weather-Protected Squirrel-Cage Motor.**

**ALLIS-CHALMERS Motors**



Three 1250-hp, 2300-volt, 3580-rpm weather-protected squirrel-cage induction motors driving pumps for oil well flooding duty.

**Here's what we mean by protection!** The roughest tests we could devise — wind-driven water equal to a 40-inch-per-hour rainfall, sand at velocities reaching 75 mph — failed to penetrate the vital areas of this Allis-Chalmers weather-protected squirrel-cage motor.

This tested and operation-proved design utilizes the same rugged construction features and engineering experience that make Allis-Chalmers motors the standard in the petroleum industry for performance and reliability.

Weather-protected motors are but part of the complete line of motors Allis-Chalmers builds for pipe line and refinery service. For more information, see your local A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

A-4908

*Silco-Flex* is an Allis-Chalmers trademark.

**NOW, Even Greater Winding Protection with Revolutionary Silco-Flex**

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Always among the leaders in the production of highest quality petroleum products and petrochemicals, Cosden Petroleum Corporation is installing the UOP Rexforming process to keep pace with the growing requirements for better motor fuels.

The Rexforming process, capable of producing gasolines having octane ratings well in excess of 100, will enable Cosden to use its UOP Platforming unit, which now produces gasoline blending material, for continuous preparation of aromatic feed stock for a Udex unit.

Rexforming, the latest catalytic reforming process, was developed by Universal and is available to all refiners. The process enables refiners to produce the highest quality motor fuels to satisfy the demands not only of today's high compression automotive engines but also of still more powerful engines expected to be offered soon to the public.

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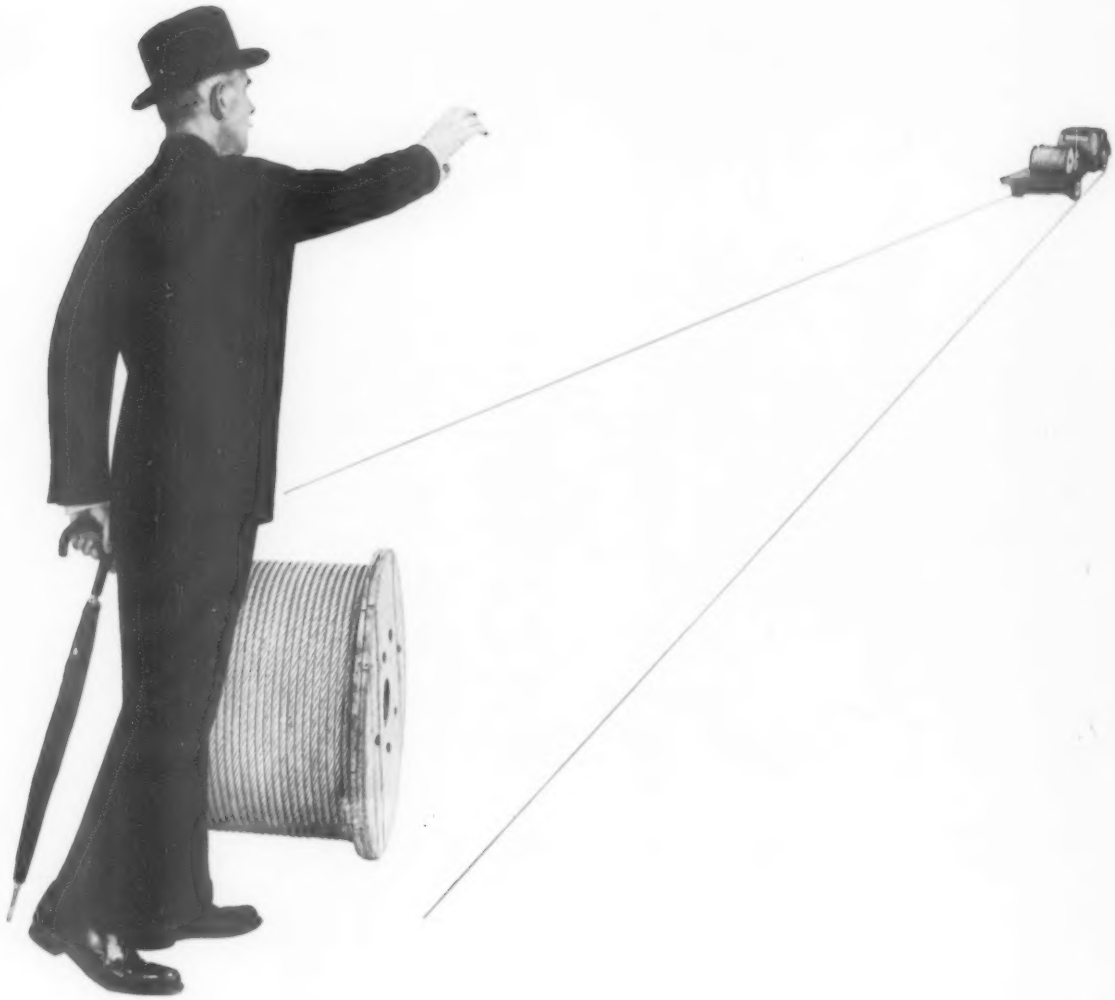

# YOUR WICKWIRE ROPE DISTRIBUTOR SAVES YOU DOWN TIME

When the lack of the proper wire rope halts your production or your operations, thank your lucky stars that your helpful Wickwire distributor is only a quick phone call away. It's a wonderful feeling...to know you'll be getting exactly what you need from his warehouse stocks in only a few hours time.

Now contrast that with the cost in time, money and inconvenience of emergency shipments direct from a distant manufacturer.

In addition to saving on down time, your Wickwire distributor effects further economies by recommending the wire rope that will give you the longest service life, by minimizing your bookkeeping, inventory maintenance and transportation costs. He keeps your reserve stocks for you so that you don't tie up capital in stand-by materials, warehouse space and unnecessary stock insurance and handling.

Your Wickwire Rope distributor is a good man to know. He's quality people handling quality products. Buy your wire rope and slings from him. You'll find that the many valuable services he offers far outweigh any apparent price advantage you might gain by buying direct.

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# GROWS WITH YOU...

The National Bank of Tulsa congratulates the ever-growing oil industry on its vision, creative genius and determination . . . its self-confidence and faith in the future.

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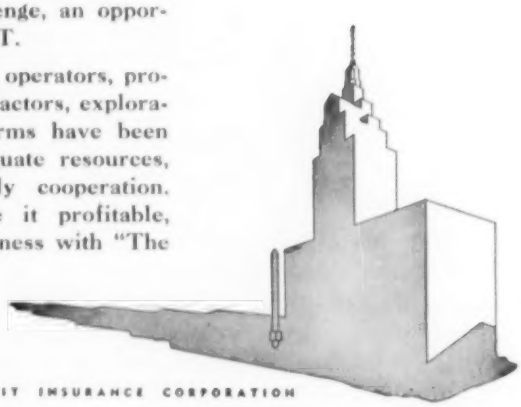

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# CLARK PACKAGE UNIT

*Torque Converter and Transmission Integral*

Operating advantages are clear and exceedingly profitable, when you use a Clark Package unit

- **vastly reduced shifting—less fatigue**
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- **reduced shocks: longer life for all gears, shafts and engine**
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A Clark to meet your need—Clark's broad line (15 to 600 hp—11" to 26" diameters) assures a size and capacity for every power-transmission requirement.

You can do as several leading manufacturers are doing: Take advantage of Clark's unique experience in the basic field of torque transmission—from flywheel to point of use—to get more useful power at less cost. Any problems?—talk to Clark.

Start by sending for the Clark Torque Converter Bulletin—a helpful statement on torque multiplication.

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**Clark Equipment Company**
**Jackson 15, Michigan**
Please send set of Clark Torque Converter Bulletins.

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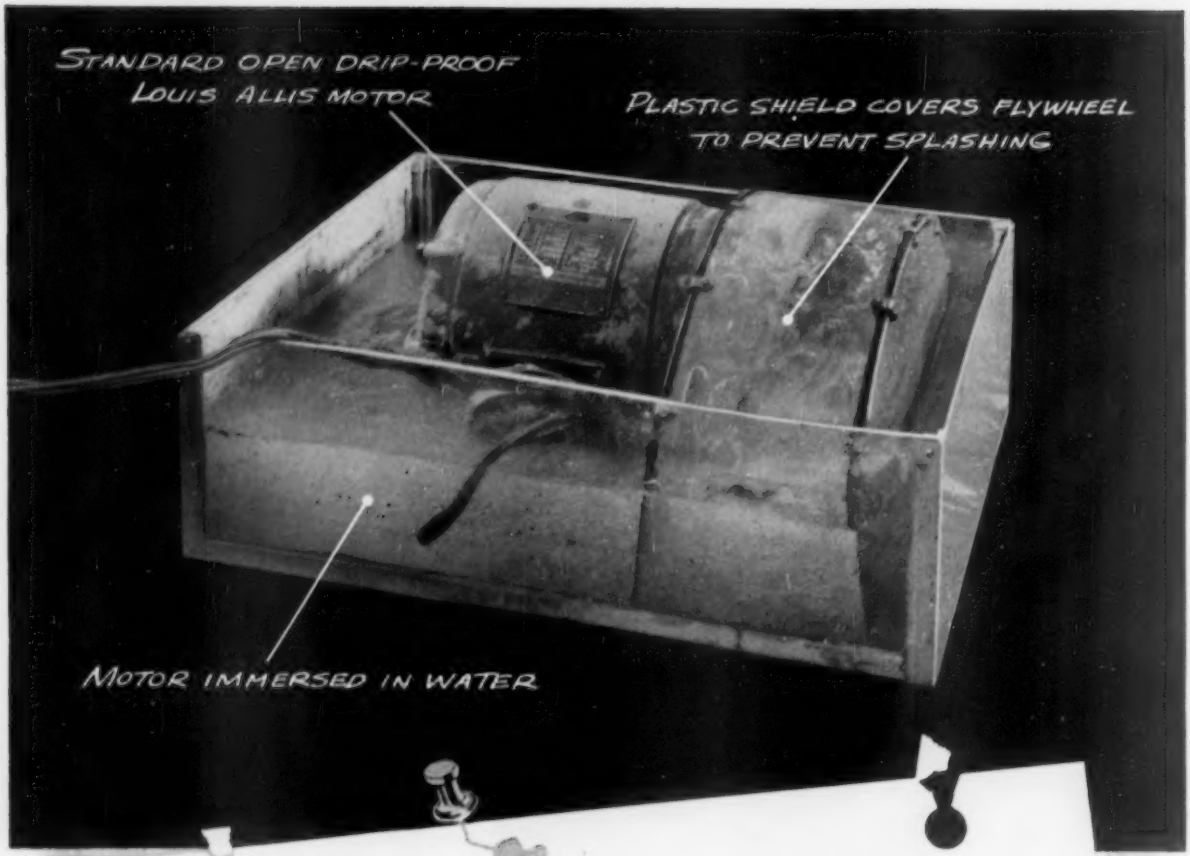



# *In water 1½ years...still running*

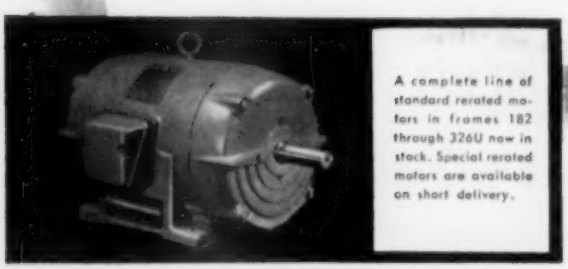
## Dramatic proof that Louis Allis motor insulation provides unusual moisture resistance

We wouldn't do this to a motor. But somebody did, to check our new insulation. They took a standard open drip-proof motor, placed it in water up to the shaft, and ran it a year and a half.

The motor will still run, too, which proves that our insulating materials are of top quality. One of our exclusive features is the new phenolic impregnating varnish we use. As you can see, this varnish resists moisture, but it also has excellent thermal and chemical resistance and is not susceptible to embrittlement.

Insulation usually determines the life of a motor. That's why the insulating materials used in the new L. A. line are the product of years of continuous research and development. That's why Louis Allis motors run longer . . . give less trouble.

Find out the many other advantages available to you in the new L. A. line of motors. Write for our new bulletin No. 1700.



A complete line of standard rerated motors in frames 182 through 326U now in stock. Special rerated motors are available on short delivery.

LA-107

**THE LOUIS ALLIS CO.**
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SMALL DETAIL

LARGE RESULT

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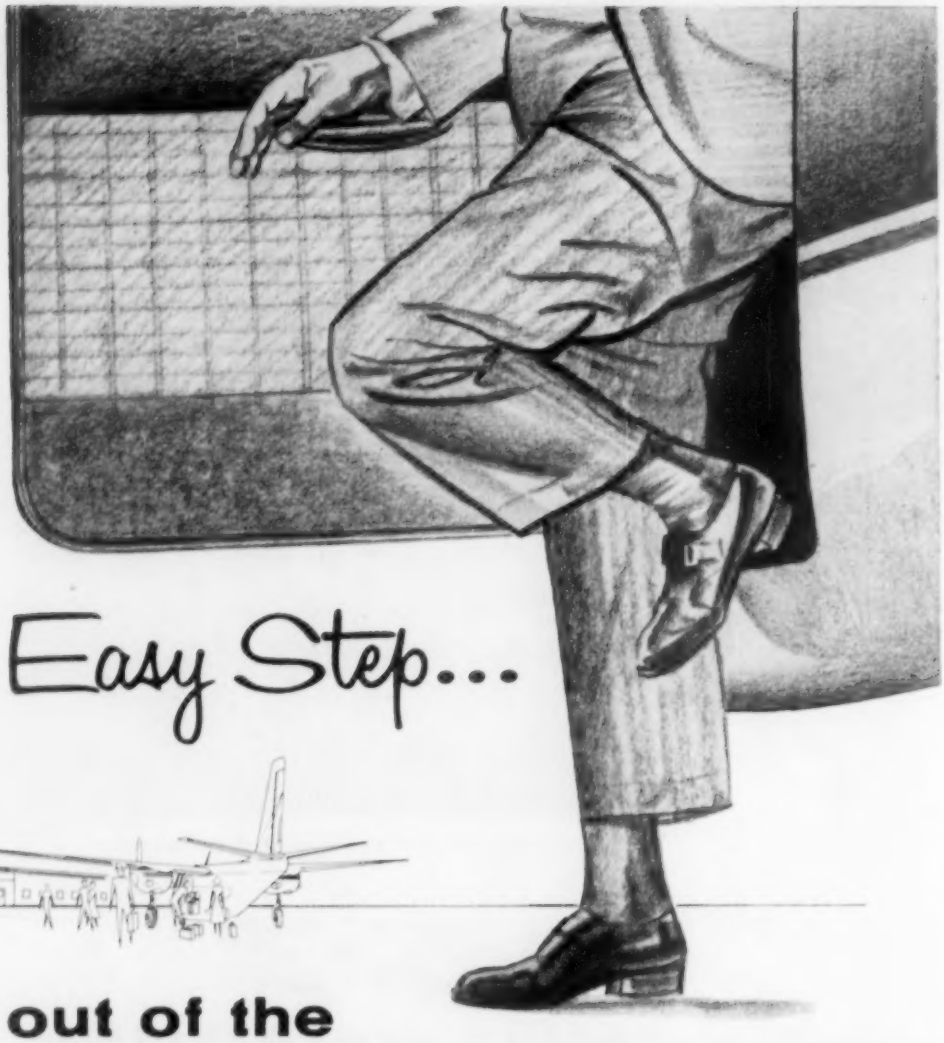
# S-3

# CASING CENTRALIZERS

Attention to details in well completion may make the difference between success and failure... the difference between a well that will continue to produce profitably and a well that is a problem to complete and will have a poor production history. One such detail is the selection of casing centralizers. The wrong choice of this one item can result in a surprising number of problems and setbacks, both during completion and later on. Best known solution of these problems is uniquely designed and built into every Halliburton S-3 Casing Centralizer. To facilitate free rotation of casing within centralizer, even in tight spots and extreme deviations, spring design and material are specified for maximum resistance to bind-causing deflection. To minimize spring breakage that may occur in butt-welded joints, S-3 springs are lap-welded to end bands. To permit good circulation in annulus, springs are held to minimum number that will give positive centering under adverse conditions. S-3 design requires little or no welding time and permits maximum interchangeability for hole sizes. In these and other details, S-3 Centralizers can contribute to the large result of a properly cemented well, resistant to corrosion and seepage, ready to deliver every barrel of oil that can be obtained. For helpful information on centralizers ask your local or district office of the Halliburton Oil Well Cementing Company for a free bulletin and complete spacing guide charts.

**HALLIBURTON** CEMENTING EQUIPMENT

250 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG



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**Ease of entrance has been a popular feature of the AERO COMMANDER from the very start. One easy step for passengers and knee-high loading of luggage and cargo typifies the convenience and comfort features built into these 5-7 place twin-engine executive transports. The same high wing design that gives the AERO COMMANDER'S positive stability in flight makes possible this effortless dignified entrance in both the 680 SUPER and the 560-A.**

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560-A · 680-SUPER

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There are other drift indicators, but *Eastman* and only *Eastman* makes one to **DOUBLE CHECK** itself ( 2 readings ) with a 40 second interval between. No batteries light bulbs . . . or photo sensitive discs are used . . . The EASTCO Self Checking Drift Indicator is COMPLETELY MECHANICAL. This instrument is very SMALL and can be go-deviled or lowered into the hole on any conventional line. Operators may contract for this instrument on a low cost daily or term RENTAL basis.

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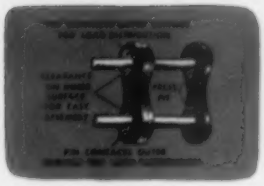
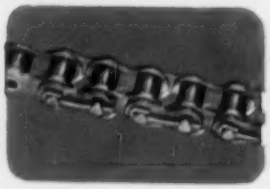
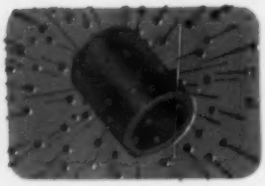
# These roller chain EXTRAS keep drilling costs down



**FASTER COUPLING** and uncoupling of multiple-width chain with E-Z Assembly.

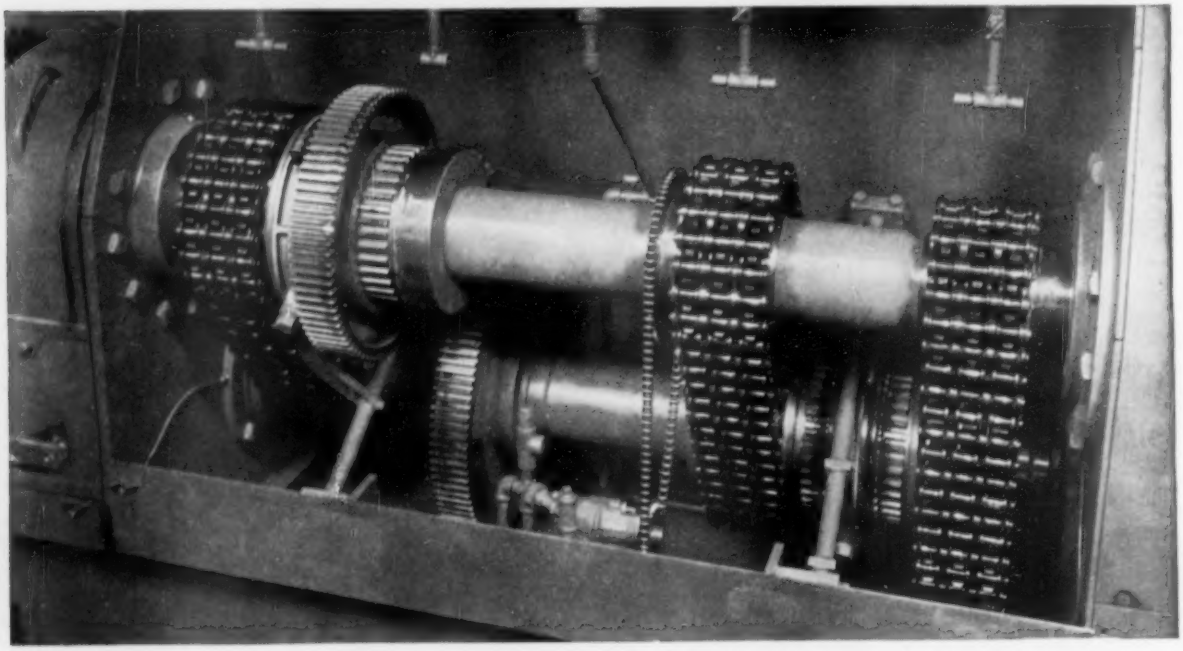


**SHEPHERD'S CROOK COTTERS** will remain in place under severe operating conditions.



**SHOT-PEENED ROLLERS** have greater fatigue life, added ability to withstand impact.

**PRE-STRESSING** of multiple width chain provides uniform load distribution.



Link-Belt Precision Steel Roller Chains insure top performance on this National Supply Company 110 drawworks transmission.

## And they're yours with every length of LINK-BELT Precision Steel Roller Chain

WHETHER you're performing a simple power transmission job or compounding hundreds of horsepower, it will pay you to check the extras you get in every strand of Link-Belt Precision Steel Roller Chain. Single and multiple width chains have proved themselves with longer-lived, more efficient performance on the toughest drive applications.

A typical extra is Link-Belt's E-Z assembly feature. Multiple-width chains can be dismantled quickly—right on the job. And, each of the extras illustrated contributes to lower maintenance and better performance. Remember, you get all these advantages *in addition* to Link-Belt's strict standards of manufacture . . . outstanding in industry.

Get extra life and reliability the next time you buy roller chain. Link-Belt makes a complete range: single and multiple widths, together with corresponding cut-tooth sprockets. Your source is the nearest Link-Belt office or any leading supply store in the field.

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**ROLLER CHAIN AND SPROCKETS**

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.

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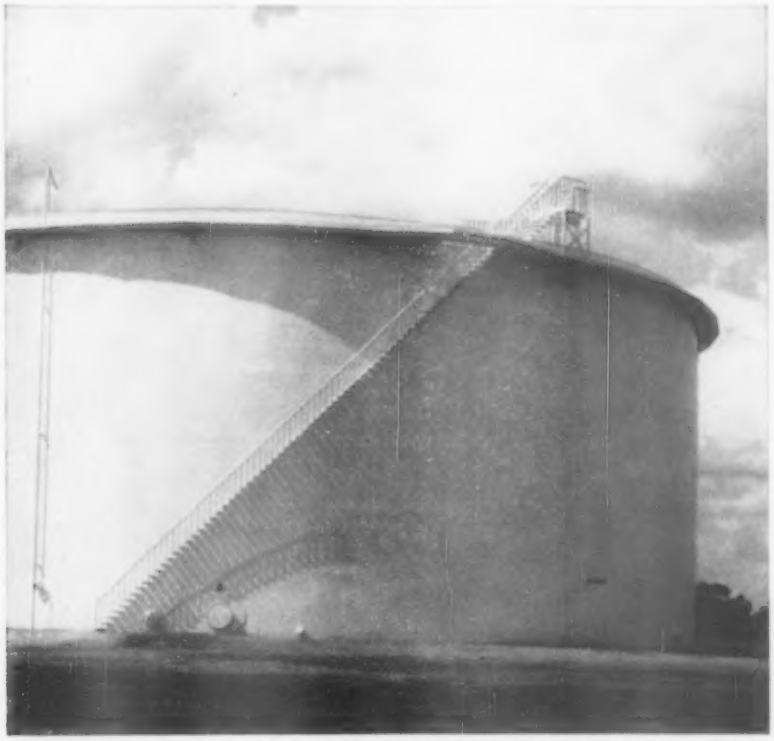


**The Sinclair Pipe Line Company** and Rockwood have developed a new integrated fire protection system that is actually built into this Sinclair Pipe Line Company floating roof tank at Humboldt, Kansas.

# A new approach to floating roof tank protection

*Now for the first time, an integral Foam-making and Foam-distribution system that brings truly modern fire protection to floating roof tanks.*

Tank fires usually occur in tanks of the floating roof type. Lightning is the chief cause of these fires.

Portable Foam hose lines could put out these vapor seal fires — *if* there was sufficient manpower — *if* the Foam lines could be placed into operation soon enough — *if* the hose streams could be brought close enough to the fire. There were too many "ifs" to this system. There must be a better way — and there was!

Rockwood, working in conjunction with Sinclair Pipe Line Company, developed a unique and practical method —

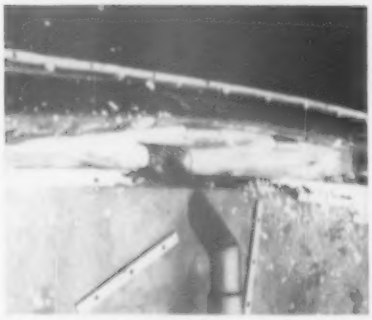
*A compact, more economical, more effective integrated system that is actually built into the tank! This system insures speedy Foam delivery and distribution in the critical vapor seal space between the tank wall and the floating roof.*

Here's an entirely new approach to protecting floating roof tanks. It not only minimizes losses, but permits the fire to be put out by one man if necessary and increases the safety of fire fighting personnel. Write for full information on this unique fire fighting idea!

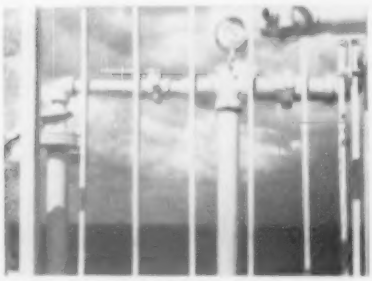
## ROCKWOOD SPRINKLER COMPANY

*Engineers Water . . . to Cut Fire Losses*

***Distributors in all principal cities***



**Tee-shaped Distributor Nozzle** discharging Foam from Rockwood Foam Maker Unit into vapor seal space between floating roof and tank wall.



**This stair platform** at top of tank shows the Foam Hydrant (top right) and Rockwood Foam Maker Unit (center) which is located so as to deliver Foam to roof area below stair platform.

**Gasoline engine driven fire pump,** Foam liquid storage tank and Rockwood around-the-pump Foam proportioning system at Sinclair's Humboldt Station. This unit has a Rockwood "L" type Metering Valve and Rockwood "B" proportioner.

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
1069 Harlow Street
Worcester 5, Mass.

Please send me full information on the Rockwood Integral Foam-making and distribution system.

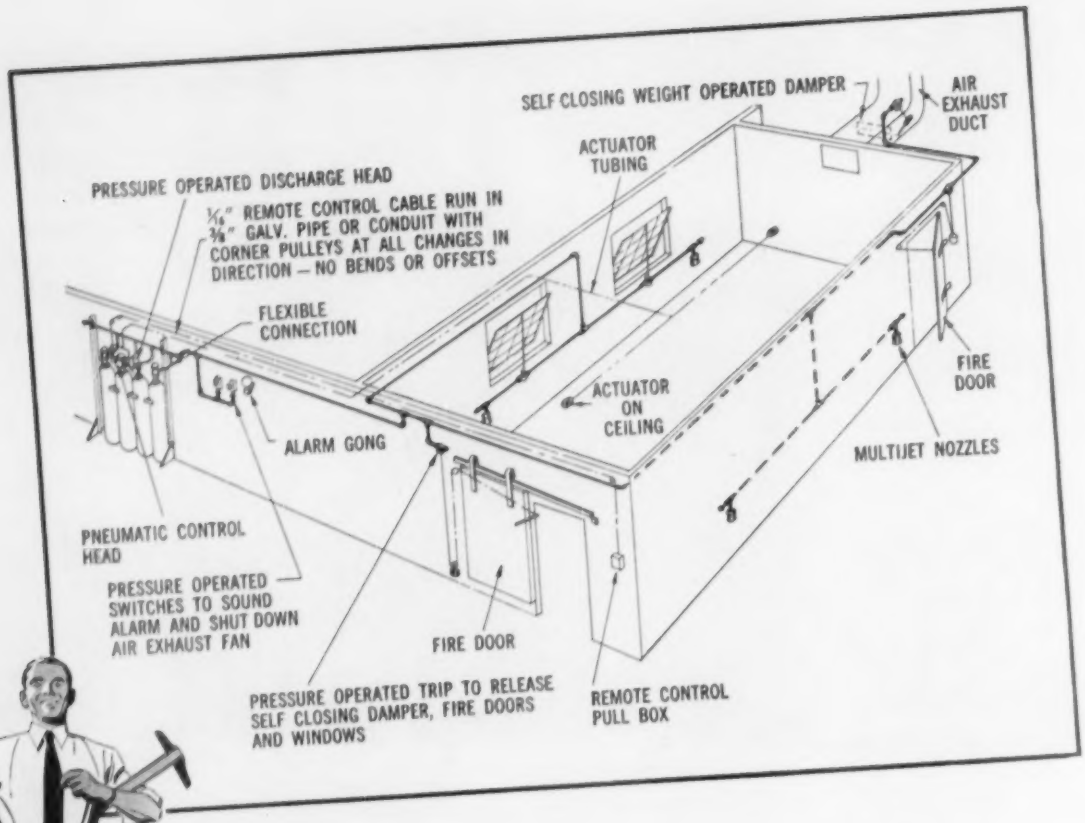
Name.....

Title.....

Company.....

Street.....

City.....Zone...State.....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1/4" REMOTE CONTROL CABLE RUN IN 3/8" GALV. PIPE OR CONDUIT WITH CORNER PULLEYS AT ALL CHANGES IN DIRECTION – NO BENDS OR OFFSETS
FLEXIBLE CONNECTION
ACTUATOR ON CEILING
FIRE DOOR
ALARM GONG
MULTIJET NOZZLES
PNEUMATIC CONTROL HEAD
PRESSURE OPERATED SWITCHES TO SOUND ALARM AND SHUT DOWN AIR EXHAUST FAN
FIRE DOOR
PRESSURE OPERATED TRIP TO RELEASE SELF CLOSING DAMPER, FIRE DOORS AND WINDOWS
REMOTE CONTROL PULL BOX

# QUICKEST, CLEANEST WAY TO PUT OUT FLAMMABLE LIQUID FIRES!

WHEN FIRE STRIKES oil or other flammable liquids, you *must* put it out quickly. And that's exactly the way Kidde systems work—snuffing out the most serious fires the minute they start, using clean, efficient $CO_2$ gas.

In the diagram above, you see a typical Kidde system installation – one specifically designed to totally flood a hazardous area with fire-killing $CO_2$ gas. This safe, sure method of fire extinguishing is the finest on the market today—each installation is *custom*-engineered to safeguard a *particular* hazard, using the *best* equipment money can buy!

Kidde systems use no clumsy, mechanical triggering methods, have no falling weights. Pneumatic or Electrical Control Heads insure instant and complete discharge of $CO_2$. Patented Kidde rate-of-temperature-rise actuators trigger the system at the first sign of a blaze, give you 24-hour-a-day protection even in case of outside power failure. The moving parts of a Kidde system are self-enclosed for safety, and have easy-to-read visual indicators which show at a glance whether the system is "set" or "released." What's more, special Directional Valves let you protect more than one hazard from the same bank of cylinders, giving you the most versatile fire protection available!

It's easy to be sure of the *best* in fire protection. For information about *your* specific problems, write Kidde today.

**Kidde**

The words 'Kidde', 'Lux', 'Lux-O-Matic', 'Fyre-Freez' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

**Walter Kidde & Company, Inc.**
**254 Main Street, Belleville 9, N. J.**
Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

# Catalysts

## Require stability, too . . .

and with Davison's *LOW DENSITY* catalyst you get commercially proven higher stability. You get a higher degree of thermal stability without affecting the resistance to attrition or other proven qualities of Davison catalysts. Commercial fluid cracking units, operating for over one year, demonstrate that this stability leads to:

**Higher surface area—Higher pore volume—Higher pore diameter—Higher catalytic activity—Improved regeneration**

This new *LOW DENSITY* catalyst is yet another Davison catalyst manufactured with controlled catalyst characteristics. At Davison you can get the catalyst best suited for your unit. For information on Davison's new *LOW DENSITY* catalyst, as well as other Davison catalysts, see your Davison representative or write.

*Progress Through Chemistry*

**DAVISON CHEMICAL COMPANY**

*Division of W. R. Grace & Co.*

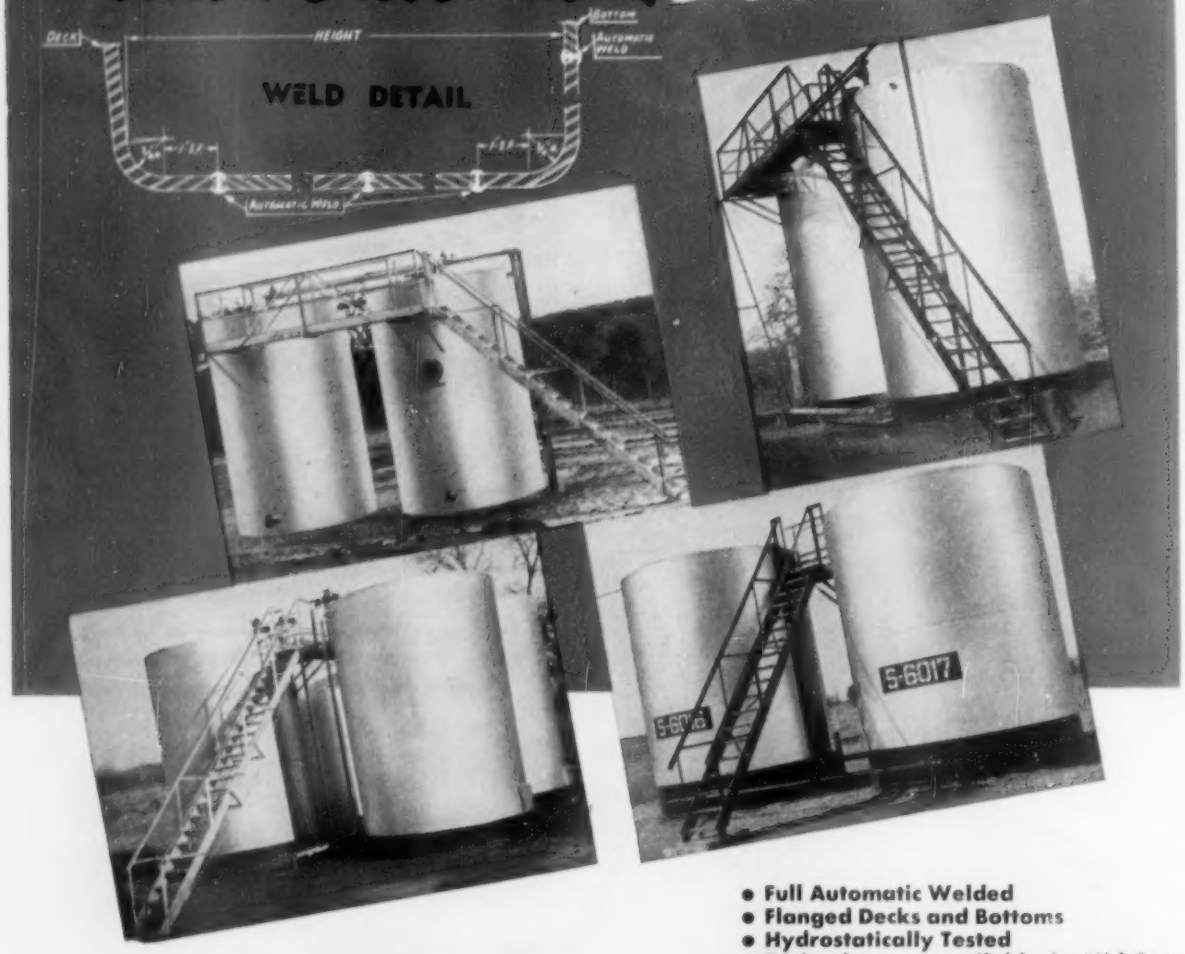
**Baltimore 3, Maryland**

Sales Offices: Chicago, Ill.; Houston, Tex.; New York, N. Y.; Baltimore, Md.
In Canada: Davison Chemical Company Ltd., Toronto

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, TRIPLE SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS AND SILICO-ALUMINATES. SOLE PRODUCERS OF DAVCO® GRANULATED FERTILIZERS.

# It's the WELD that makes M-C Welded Steel Tanks SUPERIOR




- **Full Automatic Welded**
- **Flanged Decks and Bottoms**
- **Hydrostatically Tested**
- **Trained crews available in Mid-Continent area to unload, upend, and align tanks and to erect walkways.**

M-C offers shop welded tanks in a variety of sizes which have the advantage of superior big plant workmanship, plus the advantage of meeting size requirements permitting transportation by truck or rail.

New steel plus welding by the shielded arc process (under rigid supervision), plus hydrostatic testing to insure each tank against leaks makes M-C Welded Steel Tanks SUPERIOR. Avaliable with cone or flat bottoms or with aluminum decks.

MALONEY-CRAWFORD TANK & MFG. CO.

**MALONEY-CRAWFORD TANK & MFG. CO.**

**Factory and General Office:** 38 North Peoria—Box 659, Tulsa, Oklahoma
**Export Representative:** Baird Lines, 1037 Grand Central Terminal Bldg., New York 17, N. Y.
**Canadian Representative:** Maloney-Crawford Tank & Service Company, Ltd., Edmonton, Alberta, Canada
**Texas Panhandle Representative:** Atlas Tank Company, Pampa, Texas

# RECTOR type "M"

## ..the Tubing Head that's WAY ahead ..in Flexibility

### MANDREL HANGERS

Type "A" Mandrel Hanger threaded for EUE or regular tubing.

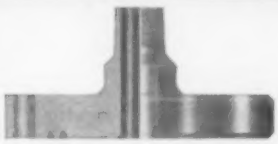
Type "M" Stripper for tubing heads with locking screws.

Type "A-O" Mandrel Hanger threaded, also grooved for locking screws. The "O" Ring serves as temporary seal.

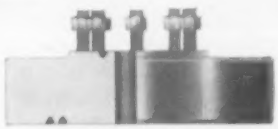
Type "WM" Wrap-Around Mandrel. It is hinged to wrap around tubing; also grooved for locking screws.

Type "C" "Slick Joint" Mandrel grooved for locking screws. The "O" Ring serves as temporary seal.

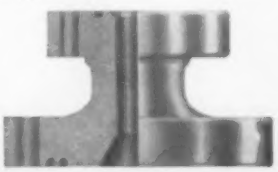
### BONNETS



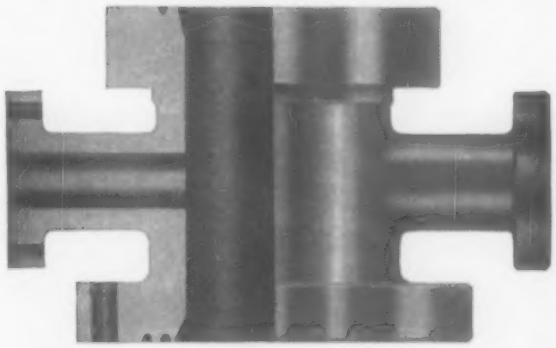
Male threaded bonnet also available with underside female threaded to hang tubing.



Studded bonnet also available with underside female threaded to hang tubing.



Spool-type bonnet also available with underside female threaded to hang tubing.



The wide range of body types (6), the complete range of pressures (2,000 to 15,000 lb. test), the variety of mandrel hangers and bonnets (10) . . . all of which are interchangeable in the bodies, plus auxiliary equipment, make it possible to select a Rector Type "M" Tubing Head for every well completion condition and preference.

Every one of these heads employs the proven Rector principle of sealing with steel . . . a single API Ring Gasket acting dually as seal and hanger hold-down. There are no soft or resilient seals in these heads to deterioriate, burn out, freeze or contract in extremely low temperatures.

When planning well completions . . . specifying Christmas Trees . . . specify a Rector Type "M" Tubing Head for the utmost in safety and flexibility.

*For complete specifications of all Type "M" Tubing Heads, Mandrels and Bonnets, see the Composite Catalog.*

RECTOR WELL EQUIPMENT COMPANY INC

★ MAKING THE OIL INDUSTRY SAFER

1100 NORTH COMMERCE ST. FORT WORTH, TEXAS

Houston Plant: 2315 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

RECTORHEAD RECTORSEAL

# PERFORMANCE VERIFIED / by acid test

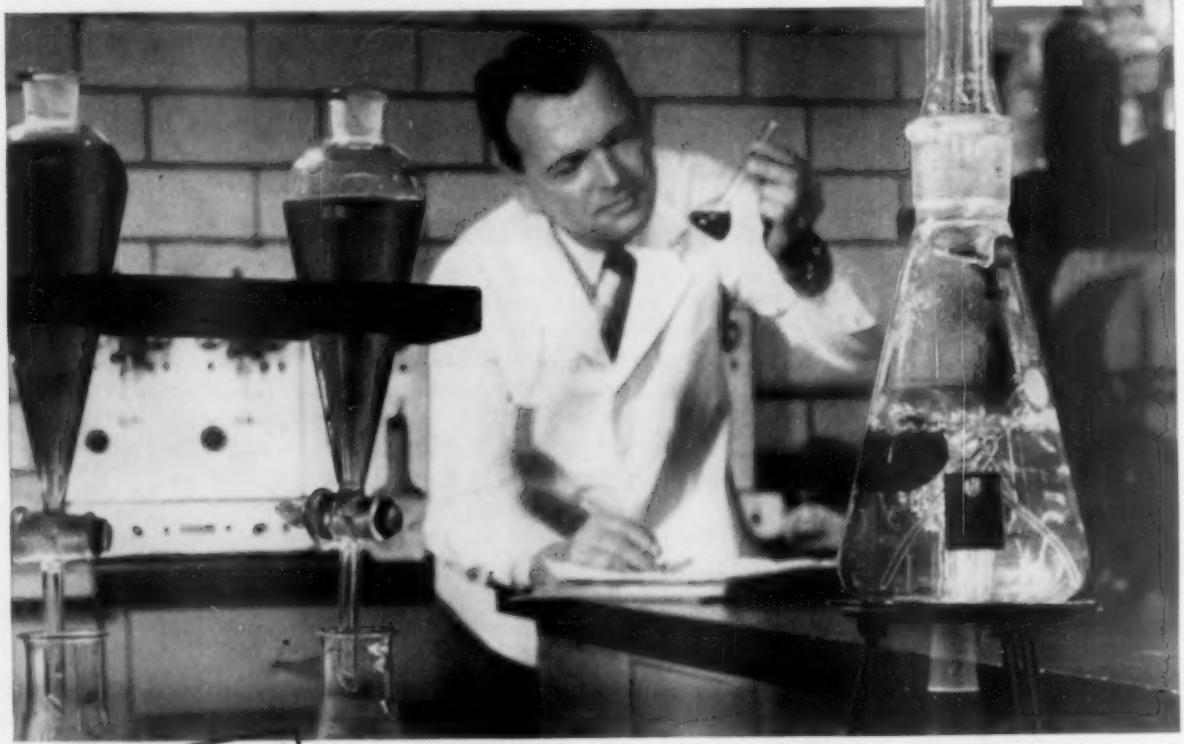
Even before a Powell Corrosion Resistant Valve is made, it must pass the acid test. For quality control begins with the very materials which go into Powell Valves.

Constant laboratory control is one of the many ways we make certain that Powell Corrosion Resistant Valves will give dependable flow control. Another is the final step of manufacture: *every Powell Valve is subjected to an actual line test.*

To keep pace with the rapidly expanding chemical and process industries, Powell has designed many new types of Corrosion Resistant Valves. The variety of pure metals and special alloys in which they are available has grown to such an extent that today there is a Powell Corrosion Resistant Valve to control the flow of almost every known, corrosive fluid.

Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our COMPLETE *quality line* which has PERFORMANCE VERIFIED.

**The Wm. Powell Company, Cincinnati 22, Ohio . . . 110th YEAR**



PERFORMANCE PV VERIFIED

FIG. 1503 SS (Sectional)—150-Pound Alloy Steel Gate Valve.

FIG. 3065 SS (Sectional)—300-Pound Bolted Cap Alloy Steel Horizontal Lift Check Valve.

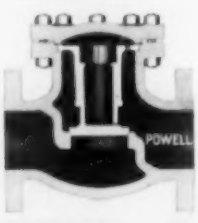



FIG. 1333 A (Sectional)—Integral Bonnet Angle Valve For Pressures of 1500 and 2500 W.S.P.

# POWELL VALVES

BRONZE, IRON, STEEL AND CORROSION RESISTANT VALVES.

# *the* LUFKIN B *Line*

## • ECONOMICAL, STURDY, AND DEPENDABLE BEAM-BALANCED PUMPING UNITS . . .

**• Where ECONOMY is an important factor, and DEPENDABILITY is a prime consideration . . . THE LUFKIN Type B Unit is the answer**

**• AVAILABLE IN THE FOLLOWING SIZES:**

B—10 D—20—4
B—16 DA—22—5
B—16 DA—30—5
B—25 D—24—6
B—40 D—34—8
B—57 D—42—10.5

• EXPLANATION OF UNIT DESIGNATION . . .
B—FOR BEAM COUNTERBALANCE
10D—GEAR REDUCER—(10,000 IN. LB. PEAK TORQUE—DOUBLE REDUCTION)
20—MAXIMUM STROKE—(20 INCHES)
4—PEAK POLISHED ROD CAPACITY (4000 LB.)

*Lufkin* **FOUNDRY & MACHINE COMPANY**
**LUFKIN, TEXAS**

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Lufkin equipment in Canada is handled by THE LUFKIN MACHINE CO., LTD., 14321 108th Avenue, EDMONTON, ALBERTA, CANADA

*Now–the Plant You Dream about...*

# Maintenance-Free because of Aluminum

**Here's Why:**

Aluminum resists rust and corrosion due to chemicals, gases, plant atmospheres, and coastal environments. You save the expense of painting and enjoy the natural bright appearance of this long-lasting metal. You save on replacement of parts destroyed by corrosion.

**Build with Aluminum Throughout**

**Aluminum Structurals** give you strengths equal to structural steel with only ⅓ the weight. Ideal for framework and supports.

**Aluminum Jacketing** provides maintenance-free beauty plus the benefits obtained from natural insulation.

**Aluminum Tread Plate** is strong and lightweight, will not spark, resists rust and corrosion.

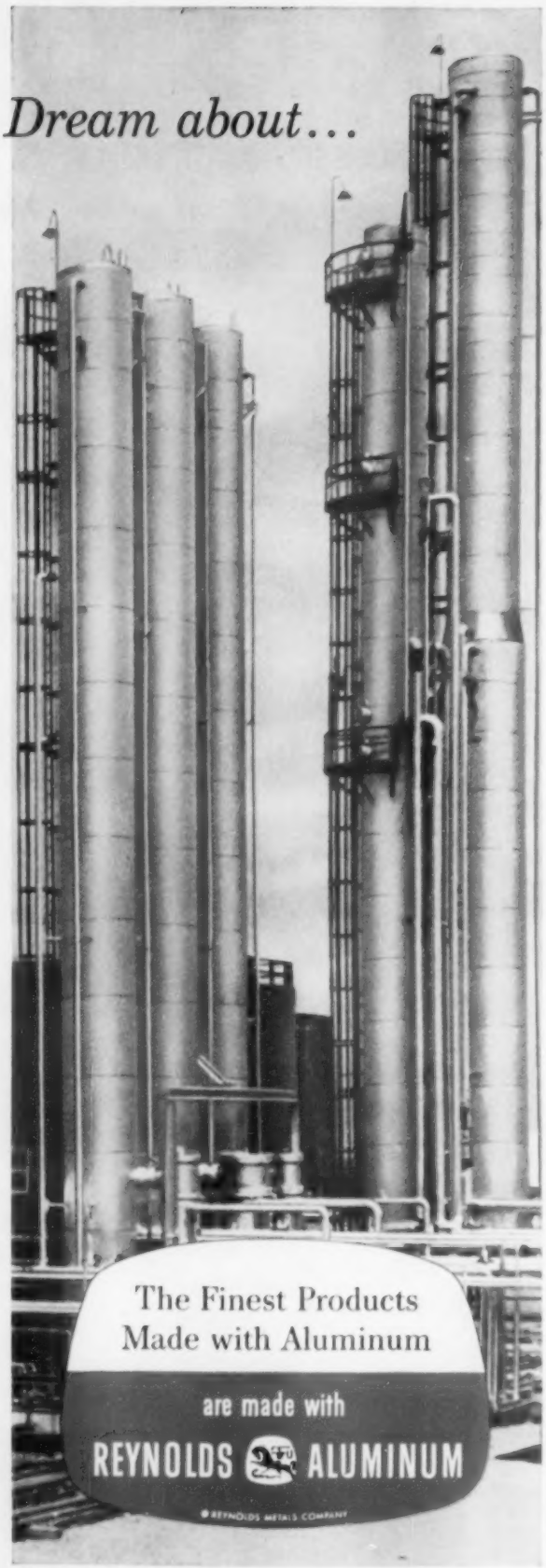
**Aluminum Heat Exchanger Tubing** offers lower initial cost, provides lower service costs.

**Aluminum Accessories** for gratings, railings, ladders and walkways.

**Aluminum Process Pipe** will not contaminate refined liquids and gases.

**Get Complete Details Today**

Call the Reynolds office listed under "Aluminum" in your classified telephone directory. Or write to *Reynolds Metals Company, P. O. Box 1800-CR, Louisville 1, Kentucky.*



# The rugged acrobats of the oil fields

# EMSCO PUMPING UNITS

## ...triumphs of counter-balance, weight lifting and endurance

Throughout the oil producing areas of the world, you'll find dependable, economical, easy-to-adjust EMSCO Pumping Units doing their job, day after day, month after month, year after year. Due to patented, rotary counter-weights, one man, working at ground level, can quickly, safely and easily adjust them. Precision-cut herringbone gears mounted on a rigid one-piece housing with an automatic positive lubrication system spell long service and economy. There are many sizes and styles of EMSCO Pumping Units for shallow, medium or deep pumping. Call CONTINENTAL today for bulletins and complete details.

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Serving the Oil and Gas Industries

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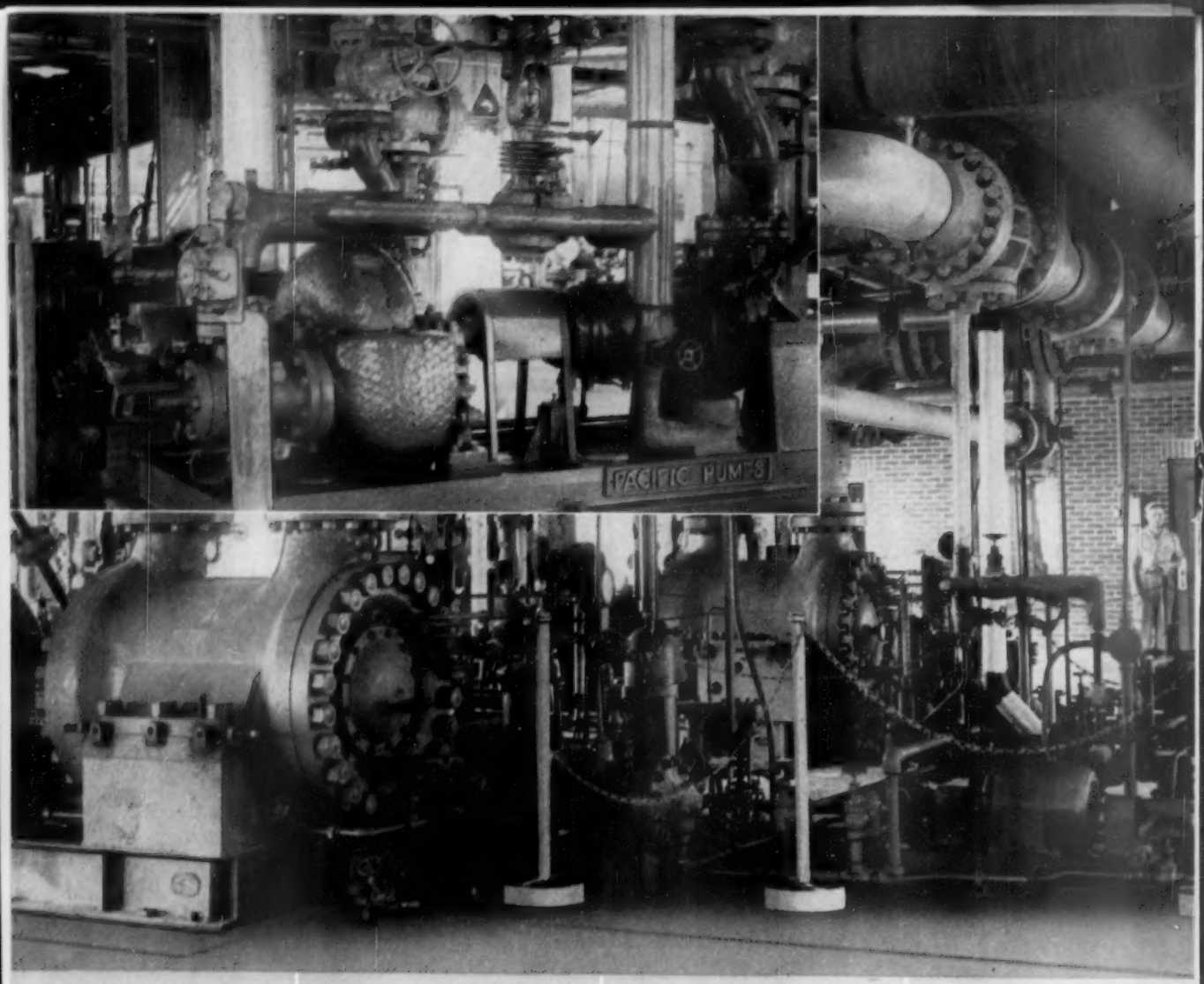
*Representatives in all principal oil fields of the world*

PT-602




**IDECO**

IDECO, Dallas, Tex.—Hydrair and Power Rigs; Full-View Masts; Substructures; Single, Dual and Drive-In Rambler Rigs; Blocks, Swivels, Rotaries; Mud Pumps; Petroleum Equipment and Supplies.

**Magcobar.**

MAGNET COVE BARIUM CORP., Houston, Tex.—Magcobar and Magcogel drilling muds and other specialized oil well drilling fluids and chemicals.

**Security**

SECURITY ENGINEERING DIVISION, Dallas, Tex., Whittier, Calif. — Rock bits, reamer rock bits and hole openers; reamers, casing scrapers and Neo-Red rubber stabilizers.

**PACIFIC**

PACIFIC PUMPS, INC., Huntington Park, Calif. — Centrifugal pumps for refineries, power stations, pipelines, and chemical plants; plunger pumps for oilwells.

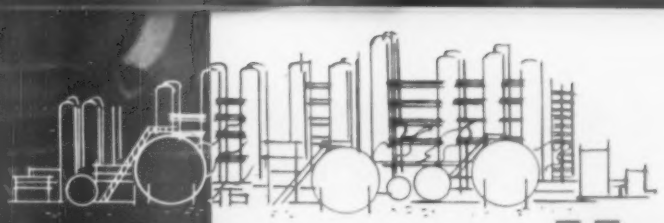
**CLARK®**

## compressors for every application

Clark Bros. Co. is the country's leading manufacturer of heavy duty compressors and turbo machinery for the petroleum, gas, process and general industry.

Clark builds a complete line of centrifugal compressors in the 1,000 – 100,000 CFM capacity range. Pressures in excess of 2,500 psi can be readily handled. Gas turbines in the 8,500 BHP class and Mobile power plants in the 5,500 – 6,500 KW capacity are also built by Clark as are axial flow compressors and recovery turbines.

A complete line of reciprocating compressors in gas, steam, diesel and electric motor driven types are available in the 75 – 4,500 BHP range. Included in the line are the world's first 2-cycle turbo-supercharged gas-engine-driven compressors. Clark builds a compressor to fit practically any heavy duty application.



# How the DRESSER *plus* works...

Throughout the petroleum and petrochemical industries, products of Dresser companies are teamed together to help produce and process the fuels and chemicals so vital to the modern world.

For instance, at Shell Oil Company's Deer Park, Texas refinery, Clark barrel type centrifugal compressors handling hydrogen at high pressure on a reforming application team up with Pacific process pumps. The Clark units, shown in the large illustration, are the first of their type placed in service.

Handling hydrogen at pressures approaching 1,000 psi calls for compressors that are the ultimate in design, material and workmanship. The fact that 75% of all reforming plants of this type use Clark barrel type centrifugal compressors speaks for itself.

At the upper left, the Pacific pumps are shown in operation moving thousands of gallons of process stock daily.

In this Clark-Pacific equipment team operators gain the experience, engineering, research and development facilities and resources of all the Dresser companies.

This in turn results in equipment that is modern in design and unequalled in performance, dependability and long life. You get the Dresser Plus ✦ by specifying Dresser products and equipment . . . the standard of comparison the world over.

ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind.—Rotary positive blowers, gas pumps, centrifugal blowers, exhausters, and positive displacement meters.

LANE-WELLS CO., Los Angeles, Calif., Houston, Tex., Oklahoma City, Okla.—Electric and Radioactivity Well Logging, Koneshot perforating and bullet perforating, packers and bridging plugs.

DRESSER-IDECO DIVISION, Columbus, Ohio—Radio and television broadcasting towers, steel buildings, aircraft hangars, mechanical parking garages, electric power substations.

DRESSER MANUFACTURING DIVISION, Bradford, Pa.—Pipe line couplings, pipe repair sleeves and clamps, weldments, forgings, welding fittings, flanges, rings.

DRESSER INDUSTRIES, INC.

OIL, GAS, CHEMICAL AND ELECTRONIC EQUIPMENT AND SERVICES

REPUBLIC NATIONAL BANK BUILDING • POST OFFICE BOX 718 • DALLAS 21, TEXAS

# ALCOA Alumina is still one of industry's "best buys"

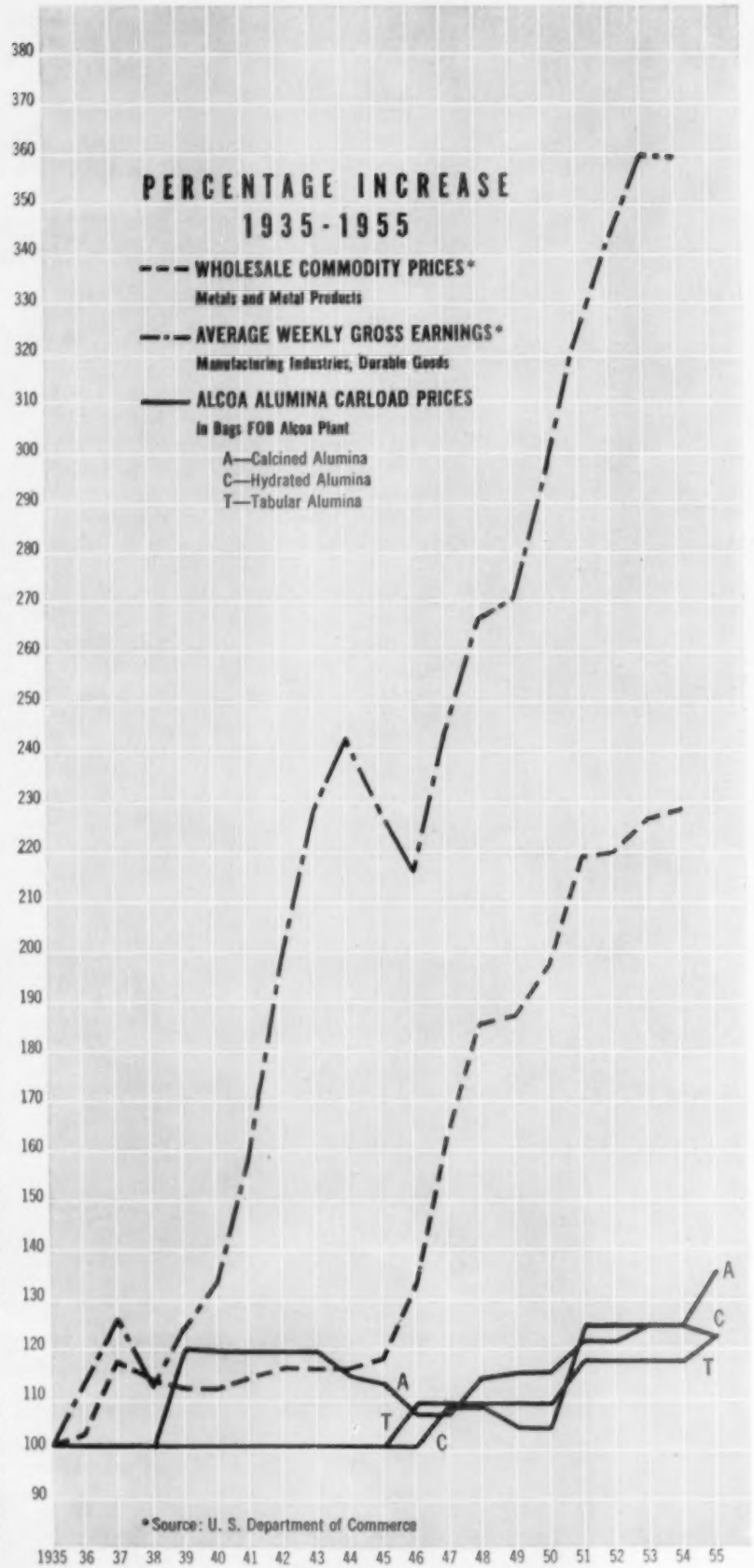
*Despite sharply rising costs, ALCOA's prices remain uniformly low since 1915*

Here is a pricing record almost without parallel in the heavy chemical industry . . . and *you* have helped to make it possible. Constantly increasing tonnages —your orders—plus improved efficiency and equipment, have enabled ALCOA to maintain the price of chemical aluminas at a low and uniform level for more than 20 years.

But many modern industries have discovered that ALCOA Aluminas are very special "best buys," regardless of price. They've found that wherever these versatile aluminum oxides are used, product quality is enhanced, performance is stepped up, processing is more easily controlled.

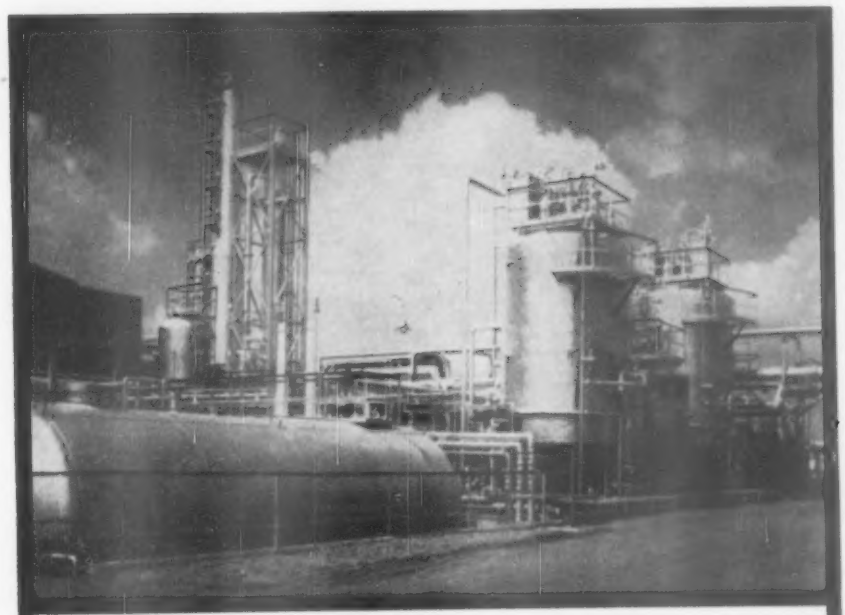
For example, ALCOA Aluminas make spark-plug porcelains more durable . . . abrasive wheels cut faster . . . refractories last longer, withstand higher temperatures. And ALCOA *Activated* Aluminas do remarkable things as catalysts and catalyst supports . . . dry gases and solids more efficiently than any other commercial desiccants . . . do an outstanding job in maintaining oils. Plastics, rubber, glass, textiles, china, enamel, cosmetics —a seemingly endless list of products— are better when they contain ALCOA Aluminas.

As in the past, ALCOA will maintain its prices at the lowest possible level. So, if ALCOA Alumina is not already one of your best buys, contact us right away. We would like to prove just how *good* a buy can be. Write to ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 715-B Alcoa Building, Pittsburgh 19, Pennsylvania.

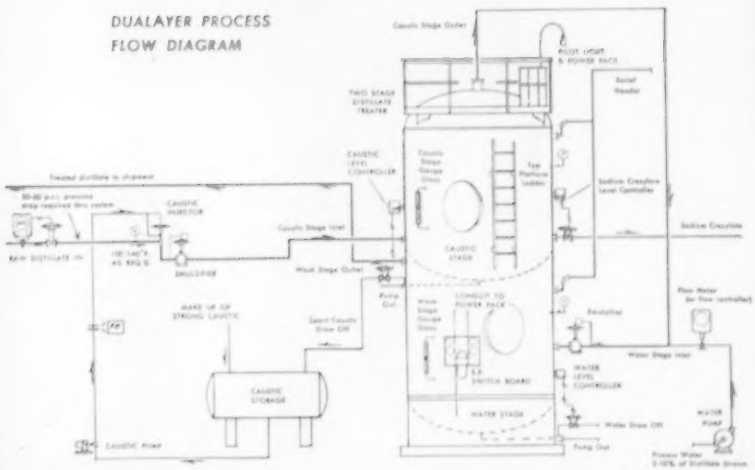


# PETRECO ELECTROFINING

## PROVIDES IDEAL TREATING CONDITIONS FOR ANY TYPE OF DISTILLATE TREATING



DUALAYER PROCESS
FLOW DIAGRAM



The photo and flow diagram at the left show Petreco Electrofining equipment utilized in the Distillate Fuel Oil Dualayer Process at the Magnolia Petroleum Company refinery at Beaumont, Texas.

In the Dualayer process, as designed by Magnolia engineers, distillate fuel oils are stabilized as to color and sediment formation. This is accomplished in Petreco equipment by contacting oils with a solution of concentrated sodium hydroxide or potassium-hydroxide. The salts of the organic acids, such as aromatic mercaptans, cresols and phenols, are insoluble in both the distillate and caustic. These liquid salts are withdrawn automatically from a layer intermediate between the distillate and caustic. The caustic is recycled for further distillate treatment. In the Electrofining vessels, treating losses are held to a fraction of 1%, consisting of only reaction products which are removed from the oil. After chemical treatment, the overhead distillate stream is water washed for removal of residual alkalinity. The wash water is removed from the distillate in a final stage of Petreco precipitation.

The two stage and three stage Petreco Electrofining equipment facilitates the operation of the Dualayer Process by providing an efficient means of precision-controlled, continuous mixing and separation. The Plant illustrated (left) has a treating capacity of 30,000 barrels per day of cat cracked distillate fuel.

Petreco Electrofining is applicable wherever it is desirable to contact a petroleum derivative with a treating chemical. It is currently in use for caustic scrubbing, acid contacting, doctor treating and Dualayer processing. In addition to the benefits that derive from inexpensive, reliable and efficient operation, the first costs of Petreco Electrofining equipment compare very favorably with that of conventional distillate treating systems.

*For complete information, write or call*

# PETRECO®

A DIVISION OF PETROLITE CORPORATION

**3202 South Wayside Drive, Houston 1, Texas • 1390 East Burnett Street, Long Beach 6, California**

*SPECIALIZED ELECTRIC PETROLEUM PROCESSING:* DESALTING · DEHYDRATING · DESAPONIFICATION · DISTILLATE TREATING · SEDIMENT SEPARATION

DT-11

Armco Casing being hauled to location from National Tank Company stocking yard.

# WITH ARMCO CASING IT'S EASY TO...

## Get what you need

You can easily meet your casing requirements from the wide range of diameters (6 inches to 24 inches) and wall thicknesses (5/16 inch to ½ inch) available in Armco Casing. Long, 40-foot lengths mean fewer sections to handle, fewer joints to assemble. The Armco Slip-Joint and uniformly round cross section allow quick stabbing and fast, easy alignment.

## Where you need it

Armco Slip-Joint Casing is distributed by National Tank Company from 25 stocking points, conveniently located throughout the oil country. Chances are one of these stocking points is near you.

## When you need it

When you need a string of casing in a hurry you can probably satisfy your needs immediately from the field stock at the nearest National Tank Company stocking point. In addition they will promptly handle your order for direct mill shipment.

Write us for more data. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 3396 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

## Armco Slip-Joint Casing

**Distributed by National Tank Company, Tulsa, Oklahoma. In Canada: National Tank Company, Ltd., Edmonton, Alberta**

**National Tank Company Stocking Points for Armco Casing.** Swift Current, Canada; Williston, North Dakota; Casper, Wyoming; Brush, Colorado; Sidney, Nebraska; Great Bend, Kansas; Liberal, Kansas; Oklahoma City, Oklahoma; Seminole, Oklahoma; Pawhuska, Oklahoma; Hobbs, New Mexico; Pampa, Texas; Lubbock, Texas; Snyder, Texas; Abilene, Texas; Electra, Texas; Odessa, Texas; Corpus Christi, Texas; Houston, Texas; Shreveport, Louisiana; Lake Charles, Louisiana; New Iberia, Louisiana; Harvey, Louisiana; Clay City, Illinois; New Harmony, Indiana.

ARMCO®

# ANNOUNCING . . .

THE

# Wilson Giant Model Slush Pump

## with Revolutionary New Features!

Photo of Wilson Pump on location. Note size in comparison to the engines. This pump is compact in design and construction, with the capability of handling high volumes, pressures and HP capacity.

MAXIMUM LINER BORE AND STROKE 7½" x 14", WITH SPEEDS OF 80 TO 90 STROKES PER MINUTE

★

DIAMOND ROLLER CHAIN DRIVE — FABRICATED STEEL CASE

★

SKF SELF-ALIGNING ROLLER BEARING CRANKSHAFT

★

LIGHT WEIGHT — HIGH SPEED — HIGH CAPACITY

★

QUICK REMOVABLE VALVE COVERS

★

EASILY REMOVABLE VALVE SEATS THAT WILL NOT "WASH BY"

★

QUICK REMOVABLE CYLINDER HEADS

★

LINER REMOVING TOOL WILL REMOVE LINER IN FEW MINUTES

★

TAPERED THREAD ON END OF RODS. ABSOLUTELY TIGHT WHEN INSTALLED, YET EASILY AND QUICKLY REMOVED

★

COARSE ACME THREAD ROD PACKING BOX, PINION ADJUSTED

★

PRESSURE LUBRICATION ON ALL MOVING PARTS BY OIL PUMP

★

ALL BEARINGS SELF-ALIGNING TYPE. SKF SELF-ALIGNING ROLLER EXCEPT SELF-ALIGNING BRONZE WRIST PIN BEARING

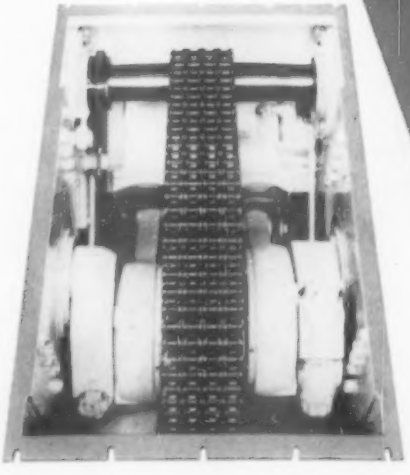
★

NEW TYPE CRANK CONSTRUCTION, HIGHER EFFICIENCY, AND LIGHTER THAN ECCENTRIC

★

MARVELOUS NEW SUCTION FLOW EQUALIZER

★



Wilson Revolutionary Chain Drive means no gears. This adds greatly to the efficiency and is proof against damage which was previously caused by gear teeth breakage.

## Be Modern - Buy Wilson

*Write Us for Details of This Unusual New Pump*

**WILSON MANUFACTURING CO., INC.**

The Home of RED IRON

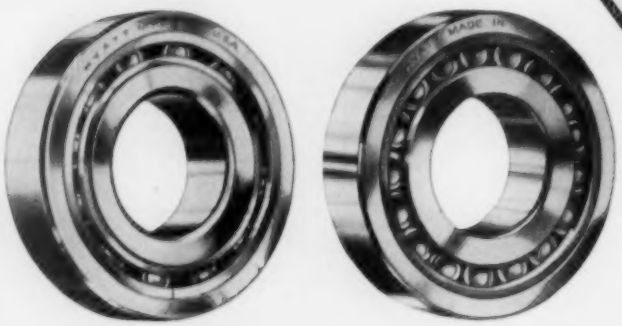
Wichita Falls, Texas, U.S.A.

# HOW TO REPLACE A HYATT BEARING

by HY WHEELER, the sage of the socket wrench

The big thing to remember, brother, is to *always* replace a HYATT with *another* HYATT of the same type and size. You know why? Because HYATTS are so precision-built they're *completely interchangeable.* You don't have to change the shaft or bore diameter a bit. This saves you trouble and keeps the boss happy, too, by making sure he gets his money's worth!

When you're ordering a replacement HYATT, just be *sure* to get the right one, either from the parts list put out by machine builders, or put down on your order all the markings from all the bearing parts.



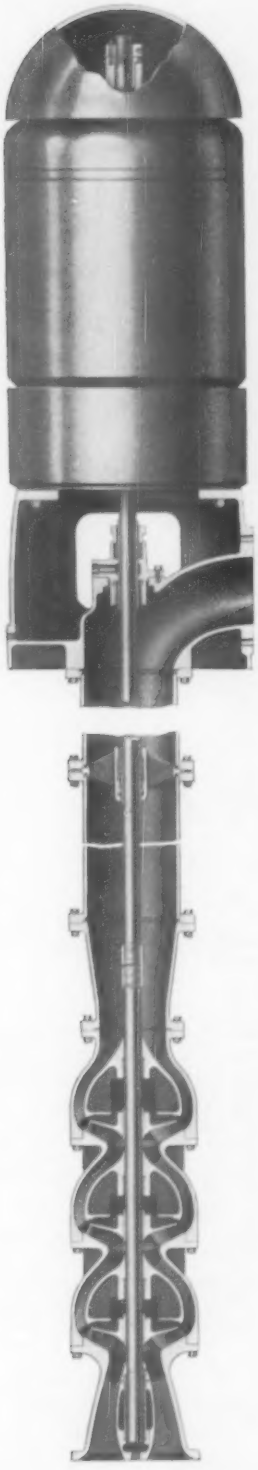
**And when the new bearing comes, *be sure it's in this familiar blue and yellow box.* When it comes to *quality,***

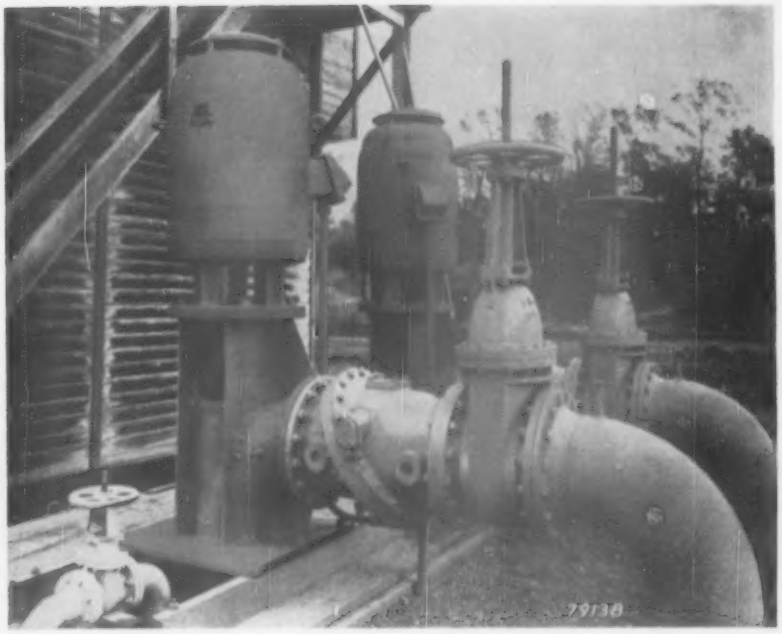
**there's no substitute for . . .**

# HYATT ROLLER BEARINGS

STRAIGHT ◯ BARREL ◯ TAPER ◯

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY





# How IR vertical turbine pumps cut installation and operating costs in COOLING TOWER SERVICE

Wherever you need to handle large volumes of water at medium to high operating heads, Ingersoll-Rand vertical turbine pumps offer these cost-saving advantages:

**Simplified Installation.** Vertical mounting with submerged suction saves valuable floor space and eliminates all suction piping. Pumps are self-priming and require no auxiliary priming equipment. They can be controlled by simple float switches. Driver is mounted above floor level, safe from flooding.

**Minimum Power Requirements.** Submerged suction permits higher operating speeds and smaller, lower-cost driving motors. Simple impeller adjustment enables operating efficiency to be easily maintained at highest level throughout the life of the pump.

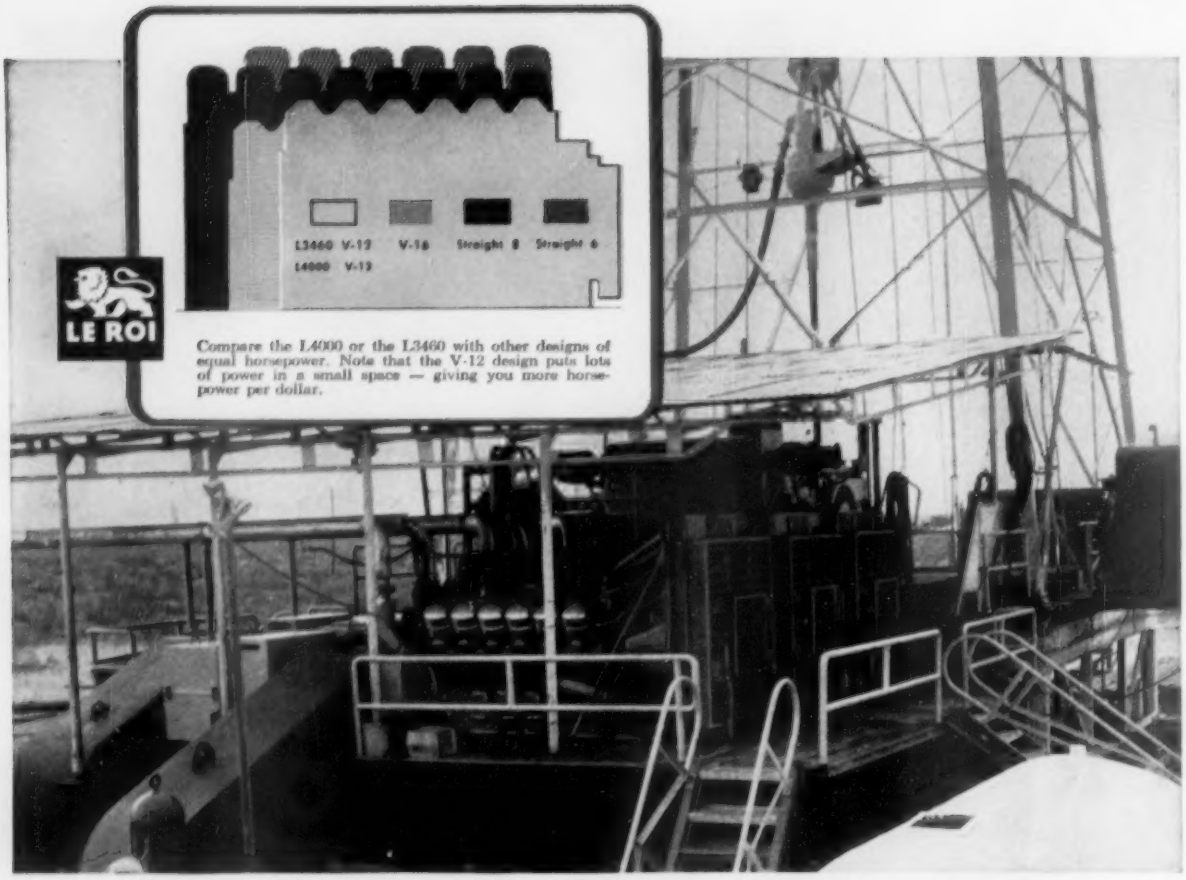
**Easier Maintenance.** There is only one stuffing box — easily accessible from floor level. Cutless rubber shaft bearings are self-lubricating and assure vibration-free operation. Oil-lubricated column bearings are also available. Adjusting nut on top of hollow motor shaft permits simple adjustment of impeller clearances from floor level.

Ingersoll-Rand vertical turbine pumps are available in single or multi-stage units with capacities of 60 to 14,000 gpm at heads of 10 to 100 ft per stage. For complete information, send for your copy of new Bulletin 7228.

**Ingersoll-Rand**

10-313 11 Broadway, New York 4, N. Y.

ROCK DRILLS • CONDENSERS • PUMPS • COMPRESSORS • DIESEL ENGINES • AIR AND ELECTRIC TOOLS


L3460 V-12
L4000 V-12
V-16
Straight 8
Straight 6
LE ROI
Compare the L4000 or the L3460 with other designs of equal horsepower. Note that the V-12 design puts lots of power in a small space — giving you more horsepower per dollar.

# *An engine doesn't have to be BIG to be POWERFUL!*

**The compact, V-12 design of Le Roi's L4000 and L3460 proves it!**

Le Roi's L4000 and L3460 engines represent the first truly new design concept in 15 years. They are compact high-output engines, designed with short stroke to give you greater horsepower and speed without compromising engine life.

In addition to the advantages of short-stroke design, these modern V-12's have lightweight pistons, short-radius rotating parts — hydraulic tappets — crankshaft vibration dampener — sensitive controls. That's why they give you hair-trigger response to load demands.

The fuel economy of these engines is good, too. Thanks to advanced-design manifolding, low friction bearings, and low power loss to accessories, they give you rock-bottom fuel consumption.

Yes, big surprises come in small packages. That's especially true of the L4000 and L3460. These engines are conservatively rated to give you plenty of power in reserve. The L4000, for example, provides 655 max. hp. and the L3460, 600 max hp. And they have a wide speed range, too, up to 1350 rpm. That's why these engines are ideally suited to a great many oilfield applications: drilling, pipeline station, generator, gas booster, etc.

Engines may come bigger than these Le Roi's, but they sure don't come better! See for yourself — ask your supply house or Le Roi distributor to show you an L4000 or L3460 at work. Call him soon. Bulletins are also available — just write for them.

**LE ROI** *Division of Westinghouse Air Brake Co.*

Milwaukee 1, Wisconsin

*you can*

# CUT YOUR MAINTENANCE PAINTING COSTS UP TO 50% *with*

## AMERCOAT 87 VINYL MASTIC

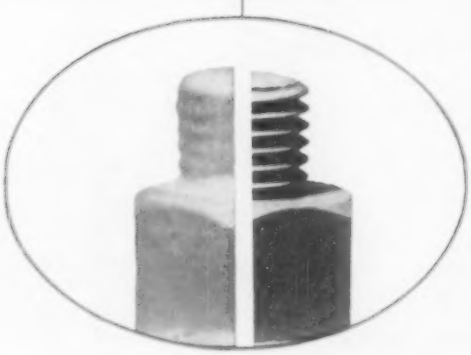
HERE IS HOW THIS REMARKABLE PROTECTIVE COATING CAN SAVE YOU MONEY:

1. Only one cross spray coat over a primed surface is required for complete protection – this means lower labor costs.

2. Fewer scaffolding and rigging shifts are required.

3. Less down time – dries to touch in minutes, eliminates the risk of contamination between coats.

4. Greater thickness means longer life – lower cost per square foot per year.



*Amercoat 87's thixotropic characteristic helps provide extra thickness on sharp edges and irregular surfaces; it is non-porous and will not crack or check.*

Amercoat 87 combines the time-tested chemical and weather resistance of vinyl coatings with the thickness of conventional mastics, yet is easily applied with standard industrial spray equipment.

We will be pleased to send you our technical bulletin describing this coating in detail.

Amercoat
**CORPORATION**

DEPT. CZ, 4809 FIRESTONE BOULEVARD, SOUTH GATE, CALIFORNIA Evanston, Ill. • Kenilworth, N.J. • Jacksonville, Fla. • Houston, Tex.

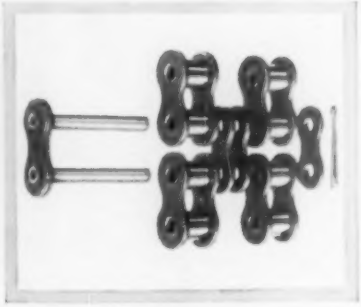
# You need easy assembly and disassembly in roller chains, too...

You know what it means, *in time and money*, to have roller chains on your rigs that take sledges, drift pins, plenty of muscle, a crew, and plenty of time to take apart...and just as much effort to assemble on the drive. It's expensive!

That's why you should have easy-to-assemble, easy-to-take-apart Rex Roller Chains on your rigs. Even multiple strands can be taken apart, easily, at any link in the strand. And you don't sacrifice any chain life with these chains. Here's why:

Rex Oil Field Roller Chains are designed so that the pins are a press fit—*for holding power*—in the outer side plates. They are a "glide fit" through the roller link and inner link plates. They're easy to take apart—and there's no better chain made!

Get the complete time-saving, cost-saving story from your supply store, your Rex® Field Sales Engineer, or write directly for Catalog No. 55-3 to CHAIN Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wisconsin.



**CHAIN BELT COMPANY**

MILWAUKEE 1, WISCONSIN

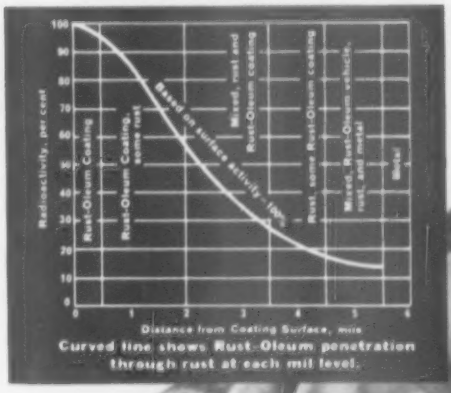
OIL FIELD OFFICES: DALLAS • HOUSTON • TULSA • MIDLAND • LOS ANGELES • NEW YORK

There is only one Rust-Oleum . . . it is as distinctive as your own fingerprint.

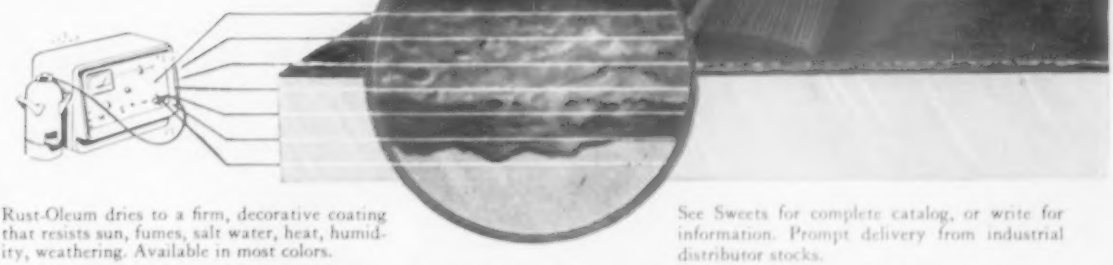
# RUST-OLEUM® STOPS RUST!

**Penetration through rust to bare metal traced by Geiger Counter**—Utilizing a modern tool of science, Rust-Oleum's *specially-processed* fish oil vehicle was radioactivated and formulated into Rust-Oleum 769 Damp-Proof Red Primer—then applied to rusted test panels. Geiger Counters then traced Rust-Oleum's *specially-processed* fish oil vehicle through rust down to bare metal. Because of this penetration, you can apply Rust-Oleum directly over sound rusted surfaces—usually eliminating costly surface preparations. Write for your copy of the thirty-page report entitled, "The Development of a Method To Determine The Degree of Penetration of a Rust-Oleum Fish-Oil-Based Coating Into Rust On Steel Specimens," prepared by Battelle Memorial Institute technologists.

**RUST-OLEUM CORPORATION**
**2542 Oakton Street, Evanston, Ill.**


Radioactivity, per cent
Distance from Coating Surface, mils
Rust-Oleum Coating
Rust-Oleum Coating, some rust
Mixed, rust and Rust-Oleum coating
Rust, some Rust-Oleum coating
Mixed, Rust-Oleum vehicle, rust, and metal
Metal
Based on surface activity = 100%
Curved line shows Rust-Oleum penetration through rust at each mil level.

Accept no substitutes. Buy—and specify only Rust-Oleum. You'll be happy that you did.



Rust-Oleum dries to a firm, decorative coating that resists sun, fumes, salt water, heat, humidity, weathering. Available in most colors.

See Sweets for complete catalog, or write for information. Prompt delivery from industrial distributor stocks.

**Rust-Oleum is available in practically all colors, including aluminum and white**

# Let this "Visiting Fireman" train your men to fight fire . . . it could save your business

You have a *potential* fire-fighting team right in your plant. These would-be fire fighters *could save your business if fire struck unexpectedly*. All they need is training, the kind that will enable them to respond instantly and properly to any kind of fire emergency.

Ansul can provide this training for a group of your men just as it has for hundreds of its customers. And there will be no charge. It is just one of the "essential" services that Ansul provides for its customers.

Twenty years experience in the fire protection industry has proved to Ansul many times over that all the fire equipment in the world will not save your business *unless* trained hands are available to man that equipment. So, it is important to Ansul that you get *training* along with the fire equipment you buy. Only then will you experience the security that goes with having a complete fire protection program. Only then will you get what you really pay for, what you really need—*complete fire protection*.

You owe it to the life of your business to learn more about Ansul's in-plant fire training service. Get in touch with your local ANSUL MAN through the yellow pages of your phone directory, he will be happy to call on you and explain all of Ansul's customer services in detail. Or write to THE ANSUL CHEMICAL COMPANY, Dept. OG-2, Marinette, Wisconsin.

ANSUL

# Even without this famous guarantee

UNCONDITIONAL GUARANTEE
If this Housing ever Breaks or Distorts we will replace it Free.
THE RIDGE TOOL CO. ELYRIA, O.

*Genuine*
RIDGID
**would still be the World's Most Popular Pipe Wrench**

**...and no wonder—millions of users know it out-performs, out-lasts all others!**

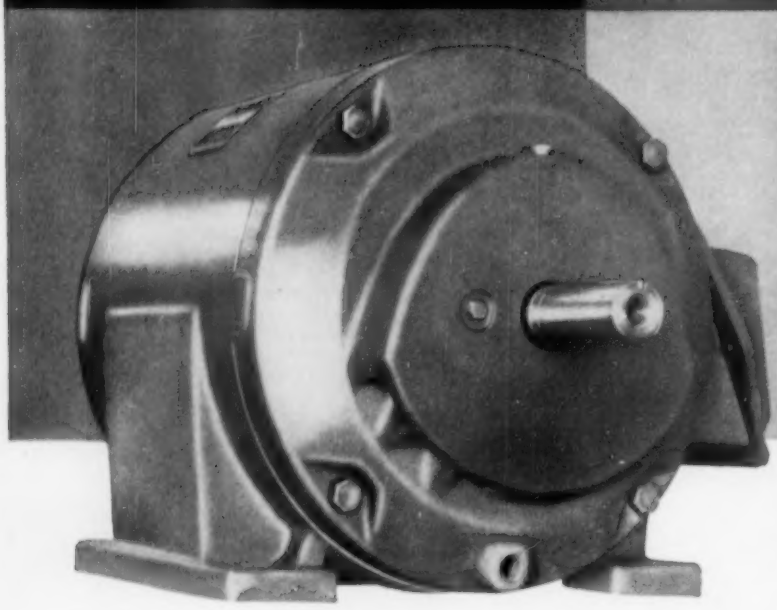
It's the "RIDGID" name that guarantees you everything you want in a pipe wrench—instant bite on the pipe, instant let-go—it can't lock, assured by patented hookjaw suspension . . . handy pipe scale, easy-spin adjusting nut, comfort-grip I-beam handle . . . and every one factory-tested before shipment! Always most for your money...your Supply House has them!

**You get more quality and more-for-your-money in all RIDGID Pipe Tools.**

RIDGID
Work-Saver Pipe Tools

**The Ridge Tool Company • Elyria, Ohio, U.S.A.**

# Totally Protected



FROM CORE TO COVER

RELIANCE Totally-Protected MOTORS

The total protection concept of design and construction armors Reliance A-c. Motors against everyday hazards, with little or no maintenance. Total protection is made up of extra features like:

Slot cell insulation of Double Backed Mylar

Dynamically balanced rotor for vibrationless operation

Entire insulation system impervious to acids, moisture and oils

Metering plate regulates grease flow to bearing

Ventilation louvres positioned high and dry in end brackets

There are 100 of these extra core to cover protection features in Reliance Motors. Each point is covered in our bulletin, "Check the 100 Facts". Why don't you write for one and get all the details?

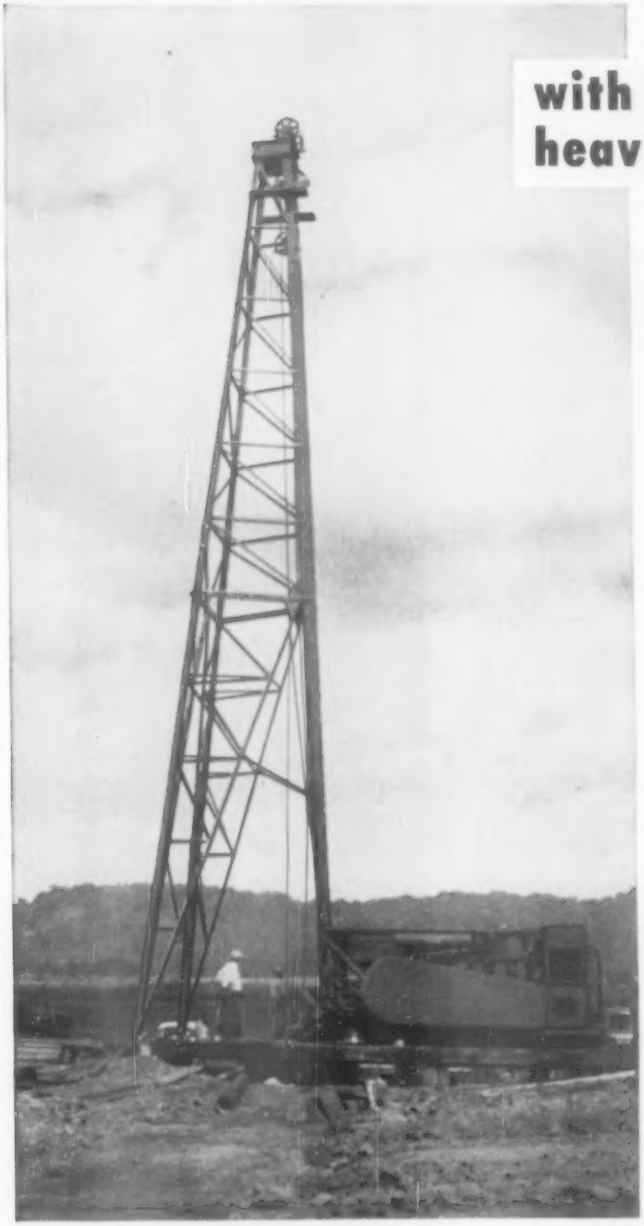
B-5510

**RELIANCE** ELECTRIC AND ENGINEERING CO.

Cleveland 10, Ohio • Offices in Principal Cities

*Canadian Division: Welland, Ontario*

# boost casing-handling capacity, retain mobility



## with 150-ton capacity heavy-duty tripod derrick

Already famous for top mobility in big capacity drills, Bucyrus-Erie 36-L and 48-L spudders can now be equipped for even greater casing-handling capacity with the addition of a heavy-duty tripod derrick. This is the *first* 150-ton derrick of this type designed especially for a spudder. Completely raised, the derrick is 70′ 4″ high; static load capacity is 300,000 pounds, when rigged for 10-part hoist.

Despite the size of this special derrick, you lose nothing in the way of mobility because it is surprisingly easy to set-up, tear down, and move. Here's why:

1. SIMPLE DESIGN. Derrick assembly consists of but five sections which include a special substructure, plus a gin pole used in erection.
2. EASE OF FIELD ERECTION. Sections are assembled on the ground, derrick legs hinged to base. With gin pole in place, derrick is raised to vertical position, using bull reel drum for hoisting. When the derrick is completely raised, the main front lower section swings into place. The gin pole is removed and you're ready to string tools. Lowering and dismantling is equally simple.
3. FAST JOB-TO-JOB MOVES. Moving the derrick, because of its design simplicity, is fast and easy. The entire structure can be disassembled into five separate units for moving.

The heavy-duty tripod derrick is available for 36-L's and 48-L's already in the field, or may be ordered with a new machine in place of the regular derrick. For all the details, see your local Bucyrus-Erie distributor.

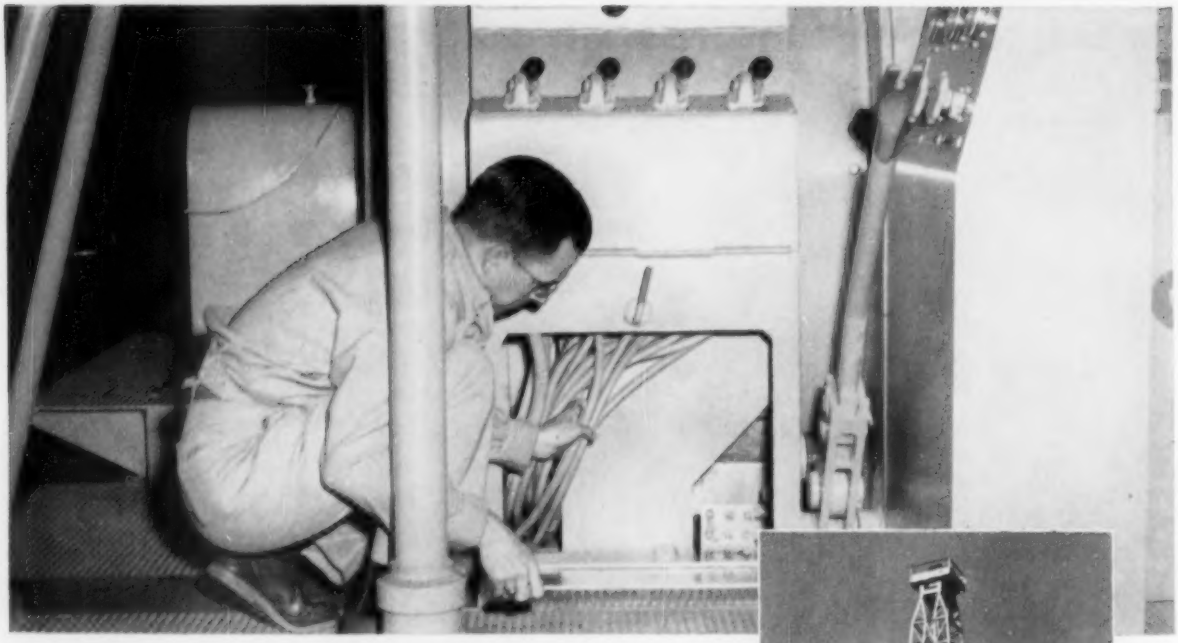
19555

**BUCYRUS-ERIE COMPANY**
SOUTH MILWAUKEE, WISCONSIN

BUCYRUS ERIE

**36-L**
Top-to-bottom drilling to 3,500 feet
Servicing to 4,000 feet
Swings up to 4,200 pounds of tools

**48-L**
Top-to-bottom drilling to 6,000 feet
Servicing to 7,000 feet
Swings up to 6,000 pounds of tools



# IDECO Selects Top Quality Aeroquip Hose Lines for its New SUPER 7-11

**In designing its new Super 7-11 rig, Ideco stressed flexibility and portability. And they made sure air systems were dependable and easy to service . . . by choosing Aeroquip flexible hose lines.**

**Here's what an Ideco engineer reports: "Aeroquip hose has played an important part in the long record of dependability established by more than 450 Ideco Hydrair Hoists in action throughout the world. Ideco has approved and recommended Aeroquip hose because of the consistently high manufacturing standards, years of reliable service and easy availability of replacements in the field."**

**There are Aeroquip hose lines with reusable fittings for all oil field hydraulic, fuel, oil, water, air and steam applications. See your supply store or write us direct.**

Aeroquip

REG. TRADEMARK

**AEROQUIP CORPORATION, JACKSON, MICHIGAN**

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

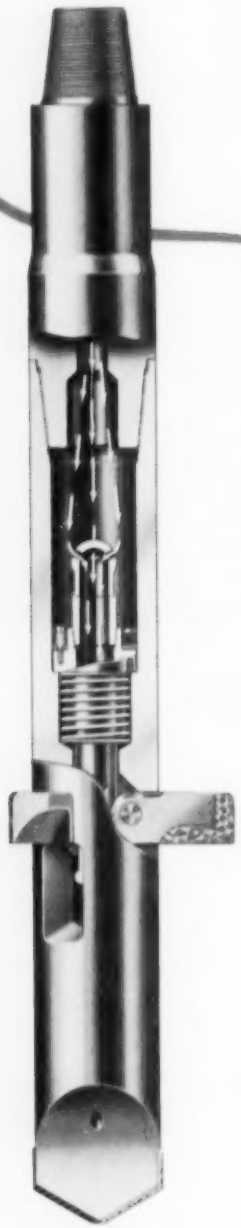
GRANT

GRANT
OIL TOOL COMPANY

*No. 2 of a series on how Grant specializes in one job: Building the Tools that help you drill wells better!*

# It puts the finishing touch on the wall of your well!

## Grant 3-Blade Wall Scraper



Model 1540
Wall Scraper

**Every operator knows that *drilled* hole is not always *finished* hole.**

**WHATEVER THE NEED,** enlarging and scraping in the capable hands of a Grant 3-Blade Wall Scraper will put the finishing touches on drilled hole for easier, safer and faster completion and work-over operations!

Take one minute to check the features that make the Grant outstanding for *all* your wall scraping operations—

**THREE-BLADE WALL CONTACT** makes the Grant smooth-running, prevents torque loads on the string, goes easy on surface equipment even while cutting the toughest formation and biggest diameters.

**BLADE OPENING AND CLOSING** are under complete operator control by simply regulating pump pressure. Blades open uniformly *as a unit*, cut to full gauge without dependence upon pump pressure.

**ADEQUATE FLUID VOLUME** for quick removal of cuttings is assured because the Grant carries full circulation to bottom. No fluid by-pass is required.

**EXTRA THICK AND HEAVY BLADES** are faced with tungsten carbide and hard facing alloy for extra hours of scraping. Blades and blade recesses are non-clogging, require no circulation for cleaning.

Drillblade Stabilizer | Underreamer | Cushion Stabilizer | Casing Scraper | Model 6480 A Reamer Near Bit Type

Grant stocks and services a complete size range of Wall Scrapers to meet every scraping need from stovepipe hole to bottom! *For the complete story on Grant Scrapers, simply write for Bulletin No. 60, or ask for the complete Grant Catalog on all Grant Tools. There's a Grant service man in your area who will gladly supply details!*

# GRANT
## OIL TOOL COMPANY

Main Office and Plant: 2042 East Vernon Avenue, Los Angeles 58, California

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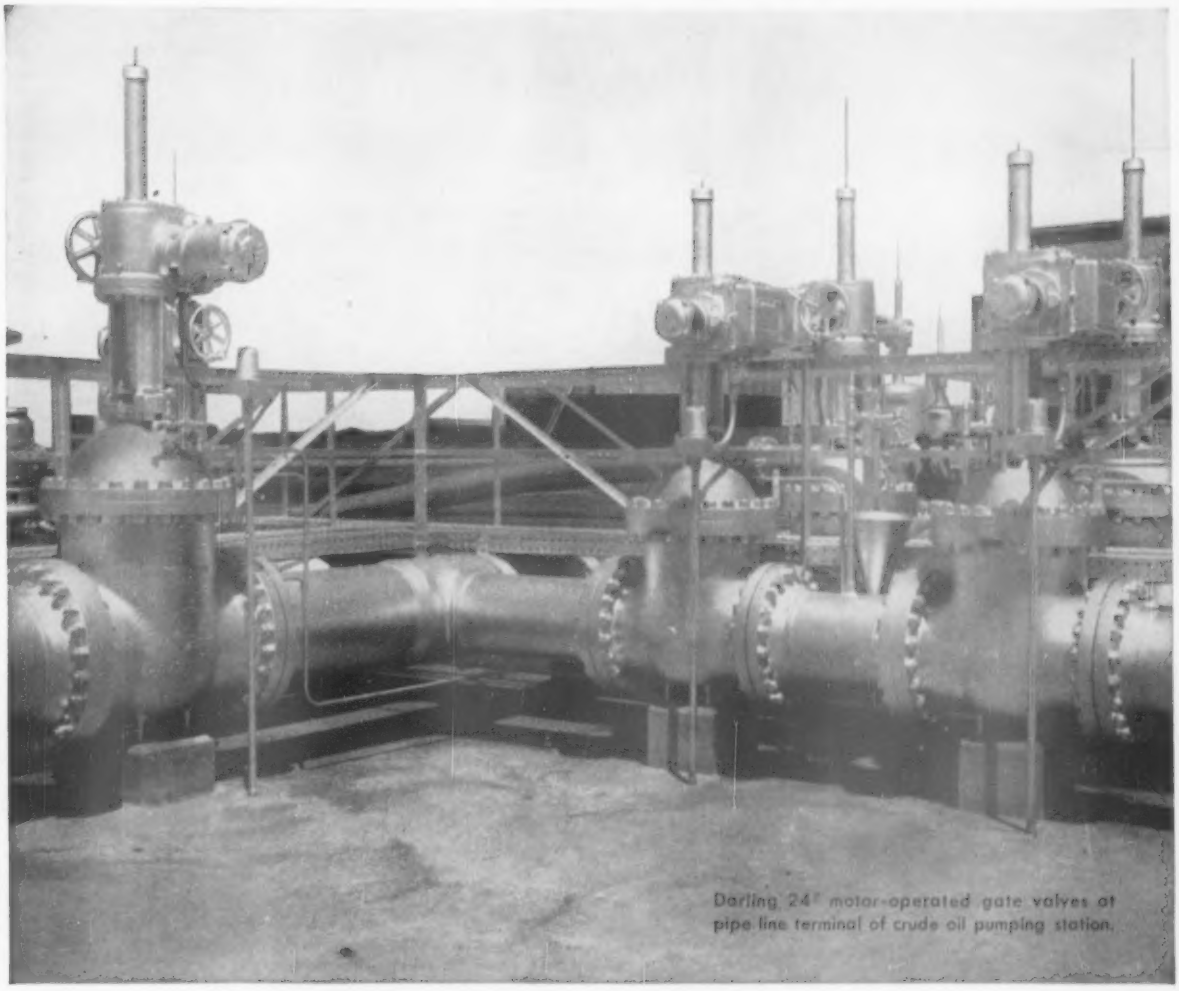
LOUISIANA—Lafayette—Phone 8-7548
NEW MEXICO—Hobbs—Phone 3-6211
CANADA—Edmonton—Phone 39-2233
EXPORT—New York City—Phone Hanover 2-2455



Darling 24" motor-operated gate valves at pipe line terminal of crude oil pumping station.

# Why Darling gate valves work better...longer!

HERE'S the simple answer. There's little that *can* go wrong with Darling *fully revolving double disc, parallel seat gate valves.* This unique principle recognizes and thus *avoids* the common sources of valve failure . . .

Take seat misalignment for example. The Darling principle automatically compensates for this common cause of leaks! Then too, there's *uniform* distribution of disc-and-seat wear, positive relief of wedging pressure as discs unseat, and *easier operation* even under pressure and temperature extremes.

Finally, with these Darling gate valves that work better, longer, you naturally minimize down time and maintenance expense. Why not get all the facts on Darling gate valves of the proper size and type for your own service needs? We'll be happy to cooperate.

**DARLING VALVE & MANUFACTURING CO.**

**Williamsport 1, Pa.**

*Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario*

# UNIQUE *OIL BASE MUD* PROVES MOST VERSATILE DRILLING FLUID

***Black Magic Offers Profitable Advantages in Many Oil Well Applications***

BY GEO. MILLER,
OIL BASE, INC.

***Most oilmen know Black Magic as the pioneer oil-base drilling mud.***

***Not so well known is the amazing versatility of this unique fluid. Black Magic has applications in a wide variety of oil well situations, due to its remarkable physical and chemical properties.***

AS A COMPLETION FLUID

Black Magic establishes the foundation for better life-long well productivity, by avoiding Jamin action, clay hydration and particle intrusion into the pay zone. Black Magic leaves the producing formation in the same condition as it was before drilling . . . simplifies completion by eliminating need for scratching or swabbing, since Black Magic filter cake disintegrates in crude oil.

AS A DRILLING FLUID

Black Magic can be made heavier . . . for deeper drilling or combatting liquid or gaseous inflows . . . or lighter . . . for drilling low pressure formations . . . than other muds. It avoids activation of heaving shale and other water-sensitive formations. It is cheaper to maintain because it is not sensitive to contamination by water – up to as much as 25% – lime, anhydrite, gypsum, hydrogen sulfide, salt, bentonites or clays. It will drill deeper wells because it is not deteriorated by maximum bottom-hole heat. It speeds drilling rate in many formations. It avoids balling of bits, and sticking of pipe due to filter cake buildup.

AS A FLUID FOR RELEASING STUCK PIPE

Black Magic flocculates clay-water filter cake by chemical reaction, then flushes away the loosened filter cake, freeing stuck pipe.

AS A PERFORATING FLUID

Black Magic avoids plugging of perforations which usually occurs when water-base materials pack and harden due to heat and dehydration in perforating operations.

AS A CORING FLUID

Black Magic speeds coring, increases life of diamond coring bits, and avoids contamination of connate water in cores.

AS A WELL-KILLING FLUID

Black Magic avoids permanent damage to formation, resulting from Jamin action and blocking of permeability by swelling clay particles, which often permanently lowers or completely stops oil production when a well is killed with water or clay-water mud.

AS A PACKER FLUID

Weighted Black Magic and Black Magic Supermix have been used successfully as a packer fluid in the annulus above production packers in high pressure wells. There is no tendency for the fluid to disintegrate or solidify, and it can be circulated out of the hole and saved or used as a drilling or workover fluid when it becomes necessary to pull the packer.

For additional information on the many profitable applications of Black Magic, contact any Oil Base representative.

## *Win $100!*

A cash prize of $100 will be awarded for the best one page letter entitled, "Where we should have used Black Magic . . . and didn't." All entries should be postmarked before midnight, March 31, 1956, and will become property of Oil Base, Inc. Decision of Judges will be final. Ask your OBI representative about further details or mail entry to Oil Base, Inc., 130 Oris St., Compton, California

OB PRODUCTS

# OIL BASE, INC.

*Plants in:* Houston • Odessa • Duncan • Compton

*Branches in:*
Houston • Odessa • Corpus Christi • Oklahoma City • Duncan • Lafayette • Harvey • Bakersfield • Long Beach • Ventura
Mexico City • Caracas • Lima • Bogota • Calgary • Paris. CABLE ADDRESS: OBI

# JONES
## SUCKER RODS
*last longer!*

**Medium to Heavy Loads?**
**Corrosive Fluid?** If these are your pumping conditions, the Jones Type 7 sucker rod is your most efficient and economical choice. • This nickel alloy rod is fully normalized, tempered, precision threaded and shot peened to combine good load lifting strength, corrosion resistance and endurance. • Physical properties and other detailed information may be obtained by writing direct.

PESA

**THE S. M. JONES COMPANY**
*Division of Buffalo-Eclipse Corporation*
General Office and Factory: **TOLEDO, OHIO**
Sales Office: Kennedy Building, **TULSA, OKLAHOMA**
Export Sales Representatives: IDECO – Division of Dresser Equipment Company, Republic National Bank Building, Dallas, Texas and Chanin Building, New York City

## From one source . . . any instrumentation you need

When it comes to measurement and control, every industrial process is different. Each demands its own combination of accuracy, economy, instrument ranges, and all the numerous other characteristics that are peculiar to the individual application.

No single instrument and its accessories could possibly fit every process. So Honeywell makes a broad variety of measuring and controlling equipment that spreads across a tremendous range of applications.

The advantages are two-fold. First, you can get all the instrumentation your process requires from a single source, so there is undivided responsibility for the complete installation. And second, you are assured that the equipment selected for your process is recommended without bias . . . neither over-sells nor under-equips . . . needs no stretching, squeezing or compromising to fit it to its assignment.

This versatile family includes *ElectroniK* indicators, recorders and controllers in circular and strip chart models, applicable to temperature, pressure, pH, power and dozens of other variables; square root flow meters for control applications; evenly graduated flow meters for cost accounting; thermometers, pressure gauges and liquid level meters; *Pyr-O-Vane* millivoltmeter controllers. Especially useful for graphic panels are the *Tel-O-Set* miniature indicators, recorders and controllers. Electric and pneumatic control systems range from the simplest to the most complex, including automatic program controls and complete systems developed for particular processes.

Working with these instruments is a full choice of primary elements . . . thermocouples, *Radiamatic* radiation elements, pressure-type and electrical resistance thermal systems, flow meter bodies, pH cells and many others. For final control elements, you can choose from a wide range of electric motorized and diaphragm operated valves. To complete the picture, there are more than 7000 non-indicating devices for controlling temperature, pressure, vacuum, liquid level and humidity . . . an unmatched variety of instrumentation made by the world's largest manufacturer of control equipment.

# Honeywell cascade control maintains accurate reheater

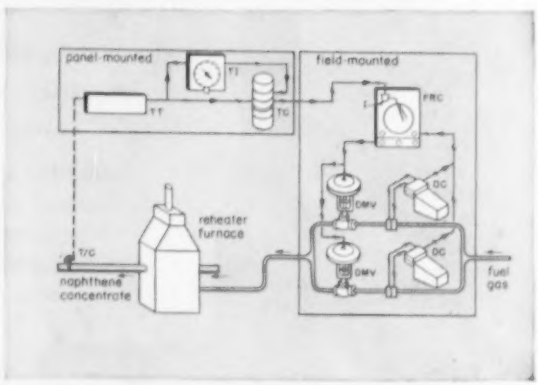
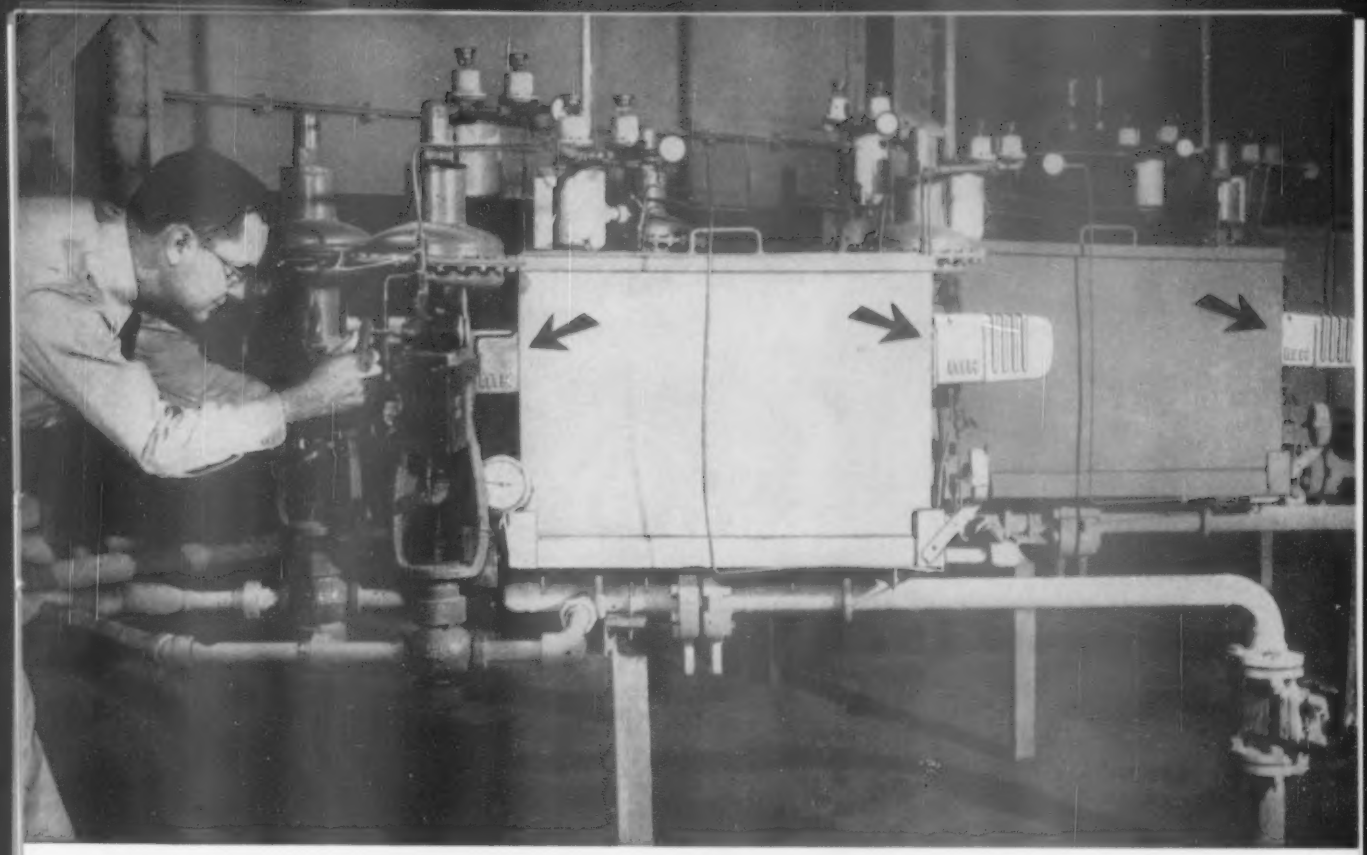



*Diagram shows basic elements of temperature control system. Grouping* ***Tel-O-Set*** *indicator, controller and temperature transmitter together minimizes control tubing runs . . . simplifies tuning of control action.*



*Flow of fuel gas to reheater furnaces is transmitted to nearby controller by* ***Differential Converters*** *(see arrows). Cascade control system actuates diaphragm valves in each line.*

# temperatures in Sun Oil Plant

SUN OIL COMPANY'S $15 million petrochemicals plant at Marcus Hook, Pa., makes use of the most advanced control techniques to assure efficient production. Designed to produce toluene, benzene, xylenes and numerous valuable by-products . . . the plant features Honeywell graphic centralized control, plus supplementary field-mounted instrumentation in specific spots where local data is needed.

The Honeywell cascade system used to regulate reheater furnace temperature typifies the intricate control instrumentation required for many processes. The furnace feeds the *Houdriformer* unit, and must supply widely varying Btu output depending on the end product. The furnace has considerable control lag, and fuel gas may vary in composition and pressure. To overcome these factors, a *Tel-O-Set* instrument on the main panel measures temperature of heated stock and resets the control index of a Brown Flow Controller. The flow instrument is located near the furnace where fireman can check readings. This controller, in turn, regulates diaphragm valves in the two fuel gas lines supplying the furnace. Adjustable limit stops in the flow controller's *Indexet* unit prevent closing of the gas valves beyond safe limits during sudden surges in temperature. The result is exceptionally consistent, close-limit control.

Numerous other specialized control applications can be readily handled by Honeywell custom-designed cascade and ratio systems. A broad variety of instrumentation, and an extensive background of experience in petroleum processing control are ready to serve you. Your local Honeywell sales engineer will welcome the opportunity to discuss your specific application . . . and he's as near as your phone.

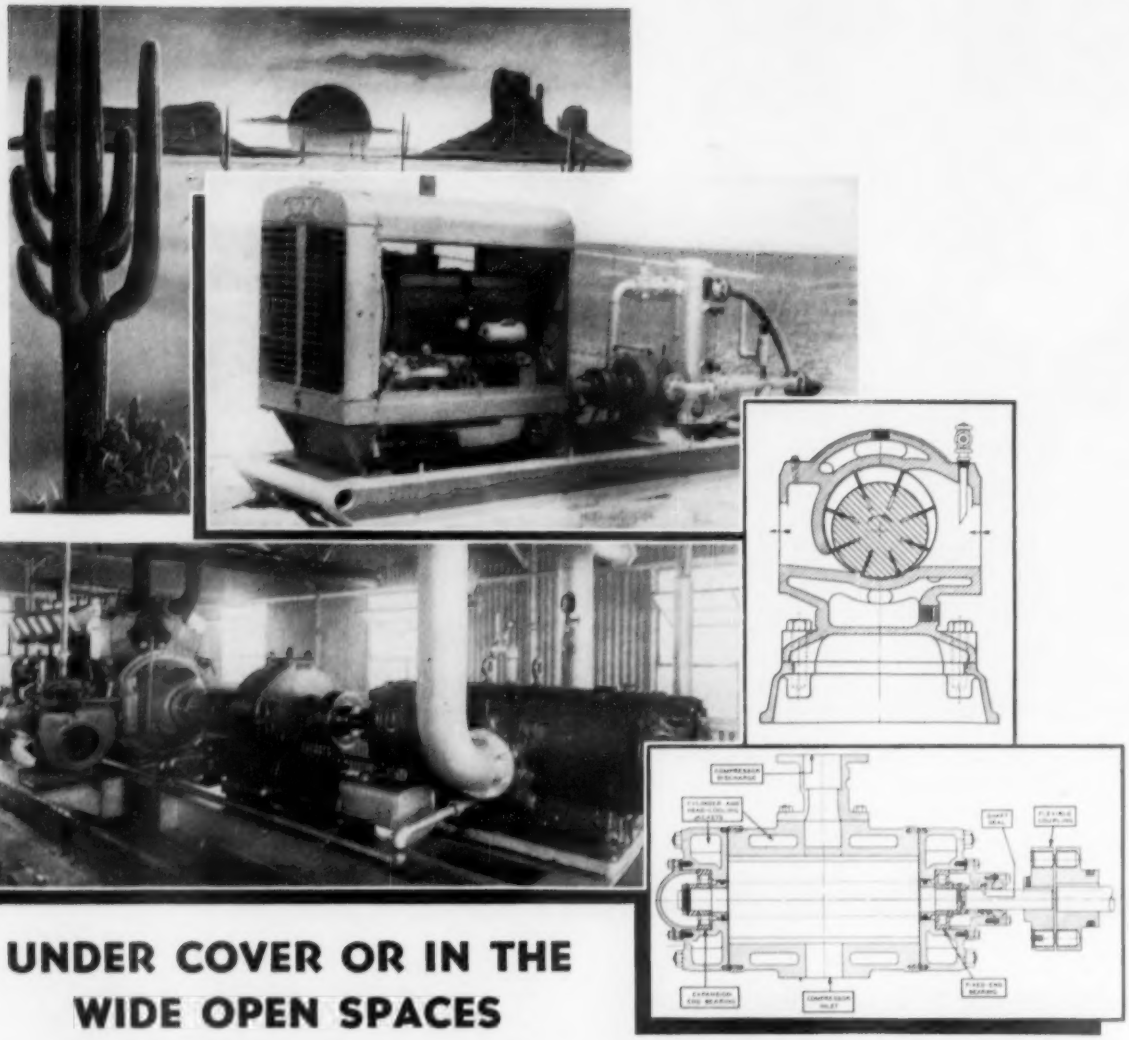
MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA:**
**Write for Catalog No. 2320 and Bulletin No. 8410**

MINNEAPOLIS
**Honeywell**
BROWN INSTRUMENTS

H HONEYWELL

*First in Controls*



# UNDER COVER OR IN THE WIDE OPEN SPACES

## . . . Fuller Rotary Compressors do a very big job

It's a job that, more and more, is being multiplied throughout the entire petroleum industry. For trouble-free gas gathering and boosting, as well as refinery gas recirculation, the Fuller Rotary Compressor has gained a wide acceptance.

Compactness, ease of installation, economy and versatility feature the Fuller Rotary packaged unit. In operation, the complete elimination of compressor valves, crankshafts, pistons and numerous other moving parts considerably brightens the problems of maintenance, and replacement. Metering problems and pressure fluctuations are reduced to zero because of pulsation-free flow due to rotary compression. Blades are held out by centrifugal force, compensating for wear, thus maintaining capacity for the life of the machine. Fuller's rotary principle is completely free of reciprocating parts, thus avoiding the basic cause of vibrations.

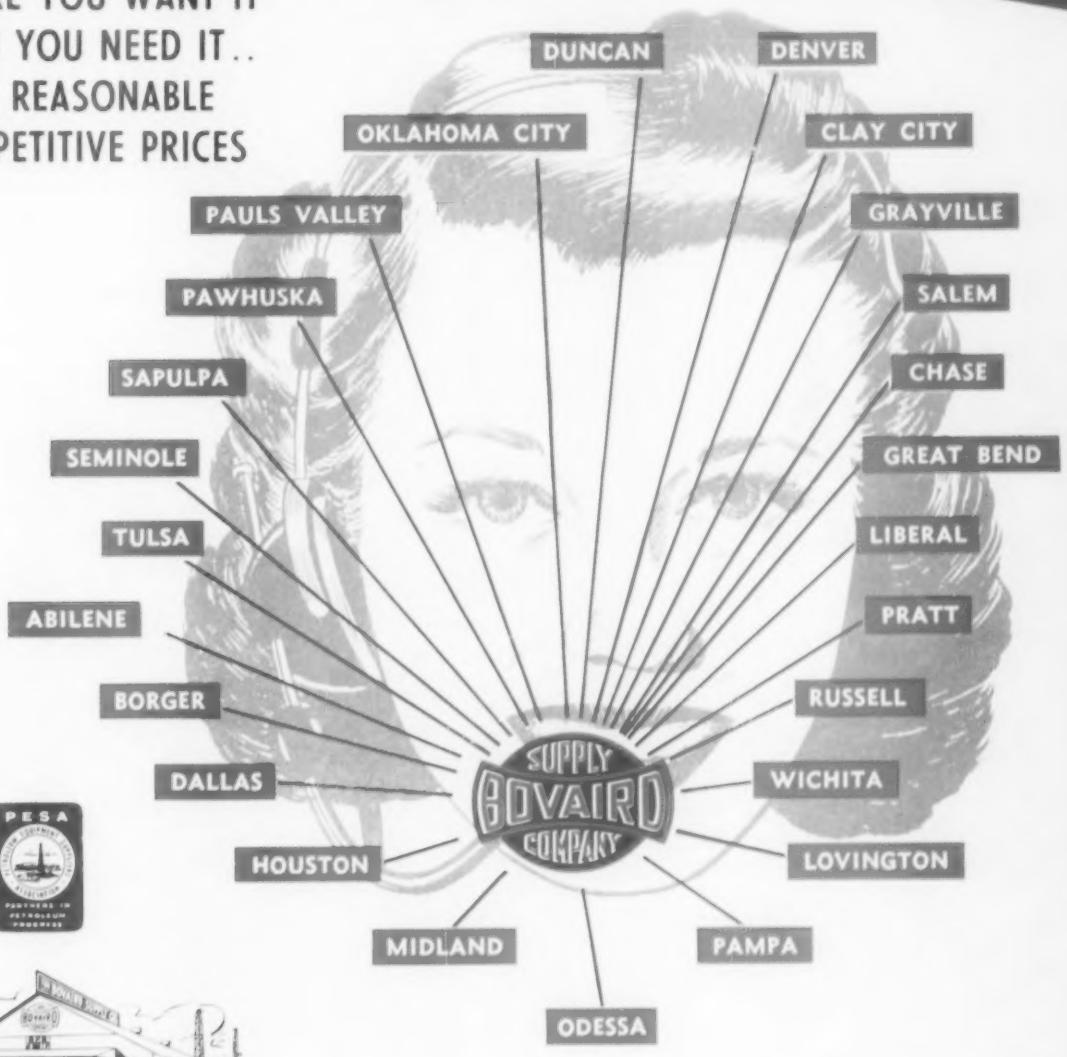
There are other eminently practical qualities, too, all of which are fully described in our literature, along with sizes and installation examples. We'd like you to have a copy. All you need do is ask for it.

**FULLER COMPANY**
**132 Bridge St., Catasauqua, Pa.**
A SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORP.
Chicago • San Francisco • Los Angeles • Seattle • Kansas City • Birmingham

**PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930**

# Where There's a WELL There's a Way...

TO GET WHAT YOU WANT
WHERE YOU WANT IT
WHEN YOU NEED IT..
AT REASONABLE
COMPETITIVE PRICES




PESA

## JUST "Buy From Bovaird"

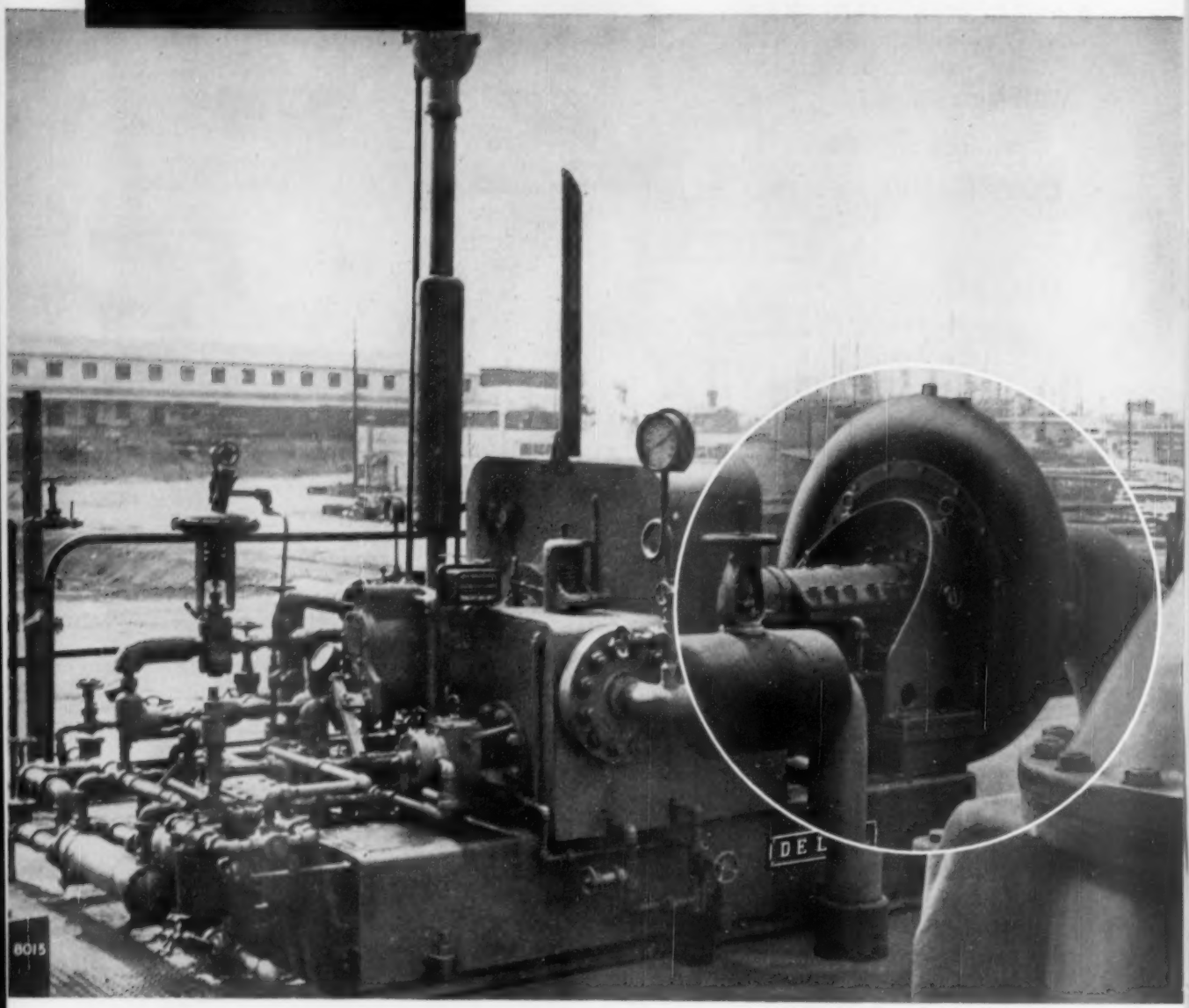
# THE Bovaird SUPPLY COMPANY

GENERAL OFFICES
TULSA, OKLAHOMA

85 YEARS OF PROGRESS WITH THE OIL INDUSTRY

# DE LAVAL
## CENTRIFUGAL BLOWER

# *controls air in cat cracker at Standard Oil of California*




This De Laval centrifugal blower, selected by the Fluor Corporation, is on stream at the Standard Oil Company of California's new cat cracker in El Segundo. For control air service, this blower delivers 9,500 cfm; inlet pressure is 15.4 psig and discharge pressure 19.4 psig. The blower is driven by a De Laval 220 brake horsepower MCP Turbine operating at 800 psig with a temperature of 650 F; it has all labyrinth shaft packing for high back pressure service.

In addition to single stage designs, De Laval makes a complete line of equipment for all refinery services, including multi-stage compressors driven by De Laval multi-stage turbines for condensing, non-condensing and automatic extraction applications.

*Send for new Bulletin 0504*

**DE LAVAL** *Centrifugal Blowers*

DE LAVAL STEAM TURBINE COMPANY

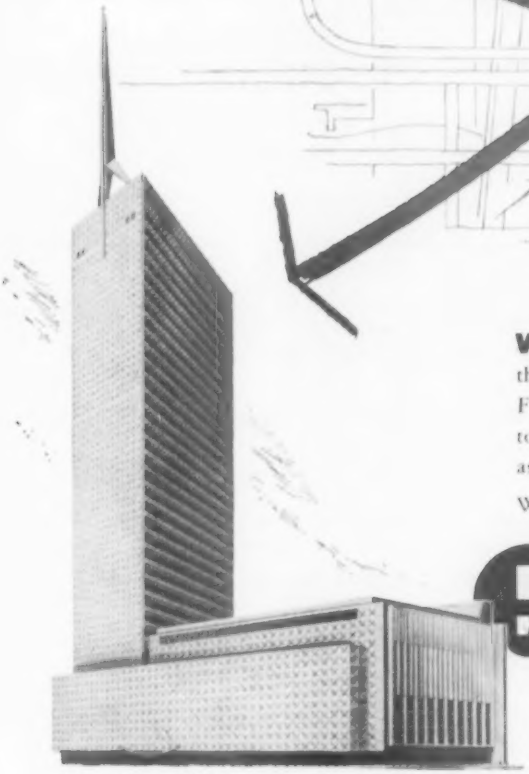
*810 Nottingham Way, Trenton 2, New Jersey*

OL 389

"those people at the REPUBLIC sure do know OIL Financing.."

We're proud of comments like this — for they underscore this fact: From Texas to the Williston Basin, from South America to the Middle East to Canada . . . Oil men know the Republic as one of the world's leading banks in Oil Production Loans.

We'd like to serve you, too!



*The Financial Center of the Southwest*

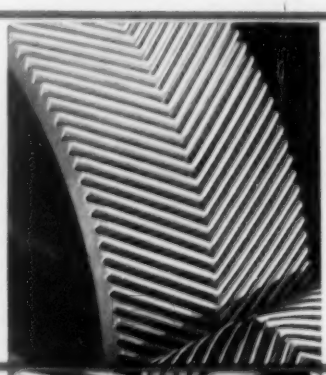
REPUBLIC
NATIONAL BANK of Dallas

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

CAPITAL AND SURPLUS $70,000,000
LARGEST IN THE SOUTH

# In the market for speed increasers? then compare these Farrel® features...

**1** GEAR WITH A BACKBONE



Instead of a center groove, the gears in a Farrel speed increaser have a ***backbone***, formed where the helices meet. This ***backbone*** puts the full face width of each gear to work transmitting power. Result: Extra strength and greater load-carrying capacity in smaller space.

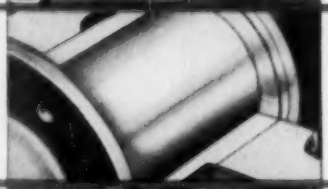
**2** "FOUNTAIN OF YOUTH"

Self-contained circulating oil system puts power on "velvet" by providing a protective spray of oil at the mesh line of the gears and pressure-lubricating the bearings.

**3** PRECISION-GROUND SHAFTS

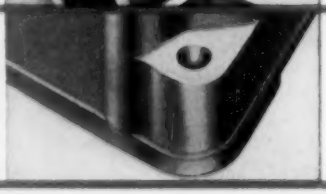
Extra large for the power to be transmitted. Give added stiffness against bending and torsional deflections under peak load conditions.

**4** OVERSIZE SLEEVE BEARINGS

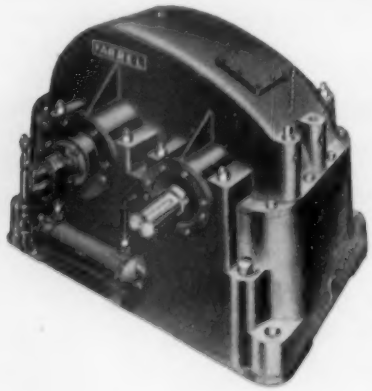


With consequent low unit pressures. Precision-finished to extremely close tolerances.

**5** VERY RIGID HOUSING



Holds rotating elements in original alignment, insuring continuous operating smoothness of the gears.



***These are the features which account for the amazing record of Farrel speed increasers. Since 1932, when the first of these units was put into service, not a single one has ever been replaced. Send for Bulletin 448-A.***

**FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.**

*Plants:* Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
*Sales Offices:* Ansonia, Buffalo, New York, Boston, Akron, Detroit, Chicago, Memphis, Minneapolis, Fayetteville (N. C.), Los Angeles, Salt Lake City, New Orleans

**OIL FIELD REPRESENTATIVES:**
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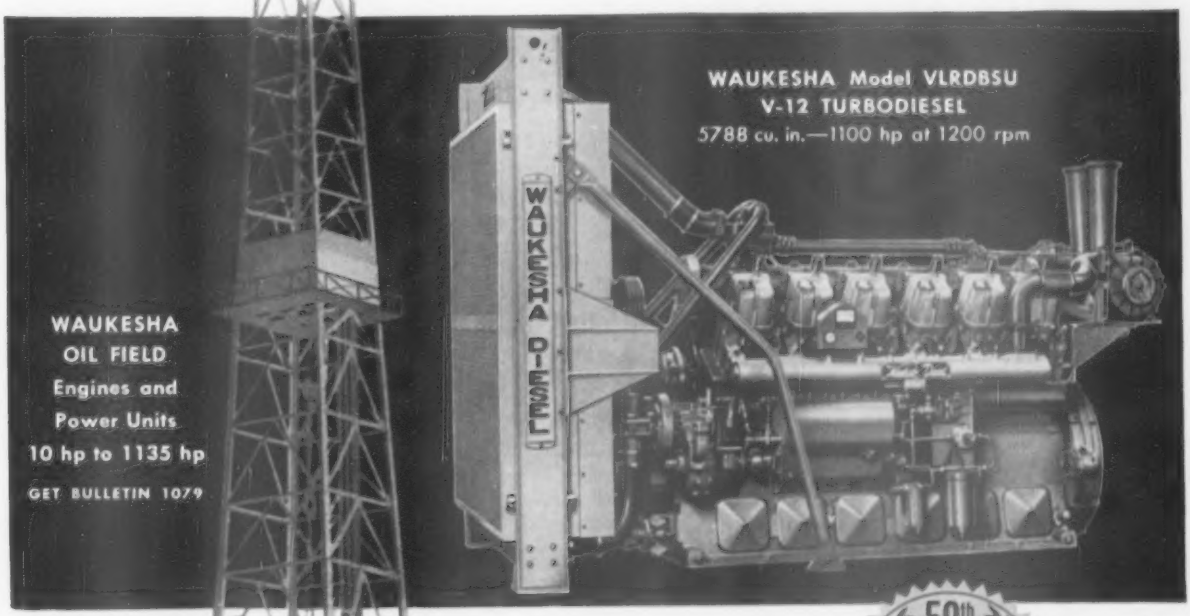
V. W. Osborne, 860A M & M Building, Houston 2, Texas

Farrel-Birmingham®

FB-1045

# FOR off-shore DRILLING




50th ANNIVERSARY
Waukesha MOTOR COMPANY
1906-1956

# WAUKESHA

296

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN • NEW YORK • TULSA • LOS ANGELES

# Pipeline protection from rust and corrosion costs so little with **UNICOR**®

The pipeline operators who use Unicor, UOP's oil-soluble corrosion inhibitor, not only get dependable protection but get it at surprisingly little cost. Such minute concentrations are required that Unicor's cost is only about $0.0005/bbl. of pipeline product.

Actually, only one molecule of Unicor is required for every million molecules of gasoline. Additional savings, too, from much reduced scraper cleaning and filter replacement costs.

Unicor is completely dependable. It prevents rusting in product pipelines at a typical concentration of 10 ppm. Addition is required at only one point and since it is distributed uniformly over the entire internal surface, protection is virtually 100% effective.

The services of our technical specialists are available to assist you in the design, installation and operation of a Unicor system of protection. Write us for samples and information.

**PRODUCTS DEPARTMENT**

**UNIVERSAL OIL PRODUCTS COMPANY**

30 ALGONQUIN ROAD
DES PLAINES, ILLINOIS, U. S. A.

# Now the finest of needle valves is available

## 416 Stainless throughout...

In the Marsh Needle Valve, operating men found a valve that was better all the way through. Then came the call for a valve of like quality and precision for corrosion service . . . to be 416 stainless steel throughout.

The valve illustrated here is the answer. Like the parent valve, this new valve has safety and strength to spare . . . guaranteed for working pressures up to 10,000 psi . . . equally efficient and effective in any lower pressure range.

It too is machined from solid bar stock—in this case, 416 stainless steel. Its precision-ground and-machined stem is hardened 416 stainless. Packing is the special "Marpak" ring . . . one-piece, non-binding, long-lasting. So finely built is this needle throttling and cut-off valve that it can be easily throttled down to exceptionally fine regulation even on extreme pressure.

Read the list of features opposite. Then write for new bulletin No. NV-2 containing complete details.

The new all stainless valves (Series 1924) includes globe and angle patterns with double female connections in sizes ⅛", ¼", ⅜", ½", ¾", 1"; also globe and angle valves with male inlet and female outlet in sizes ¼" and ½".

**MARSH INSTRUMENT CO.** Dept. L, Skokie, Ill.
Sales affiliate of Jas. P. Marsh Corp.

Marsh Instrument & Valve Co. (Canada) Ltd.
8407 103rd Street, Edmonton, Alberta, Canada

HOUSTON BRANCH PLANT: 1121 Rothwell Street, Sect. 15, Houston, Texas

### 416 Stainless Steel ...all the way through!

- Body and stem guide machined from bar stock.
- Valve stem, hardened stainless.
- Packing, special Marsh "Marpak" moulded ring.
- Fine stem threads for strength and precision throttling.
- Deep inlet and outlet thread chambers.
- Bodies marked in accordance with MSS regulations.

**Maximum Working Pressure 10,000 P.S.I.**

Water, oil, gas or corrosive fluids not injurious to 416 stainless steel.

# MARSH

"THE STANDARD OF ACCURACY"

Another New
WmSON - HILLCO
TAPPING MACHINE
EASY ACTION CLUTCH
AUTOMATIC CUTTING FEED
MODEL 360
HEAVY DUTY BEARINGS
HAND POWERED OR WITH AIR MOTOR DRIVE
REFINERIES • STEEL MILLS
PIPELINES • CHEMICAL PLANTS
For making high pressure, high temperature taps into piping and tanks WITHOUT SHUTDOWN
• 24" BORING BAR TRAVEL PERMITS
PIPE TAPS TO 6"
TANK TAPS TO 6"
MAXIMUM OPERATING PRESSURE 1,440 PSI AT 100° F
MAXIMUM TEMPERATURE 700° AT 700 PSI
EACH MACHINE TESTED TO: 2,175 PSI
SELF ADJUSTED CHEVRON PACKING
INTEGRAL FLANGE FORGING
ASA 600 RTJ FLANGE
CHROME PLATED BORING BAR
*NEW FEATURES FOUND ONLY IN 360 MACHINE WHICH SUPERSEDES MODEL 300
T.D. Williamson, Inc.
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# They Say—

### Absolutely Obsolete

Dear Sir:

Allow me to congratulate your printer's devil for coining the word OBSOLUTE on the enclosed cutting from your Journal for 2nd May, 1955. We

> **Modernizing Obsolute Pumping Equipment** 93
> *By Frank Poorman*
> Results of a study of Healdton field show that modernization of 249 wells increased production 10.4 per cent. This increase was registered while the number of operating wells was reduced 27

have assumed an interpretation "absolutely obsolete" which tag certainly cannot be appropriately applied or appropliplied to your excellent publication.

W. J. C. Cooke
Director
Trinidad Central Oilfields, Ltd.
San Fernando, Trinidad, B.W.I.

### Road Users Already Pay

Dear Sir:

We note that your January 23 issue carries in its "Watching Washington" column by Bertram F. Linz the somewhat categorial statement that "Everybody wants more highways, but nobody seems to want to pay for them."

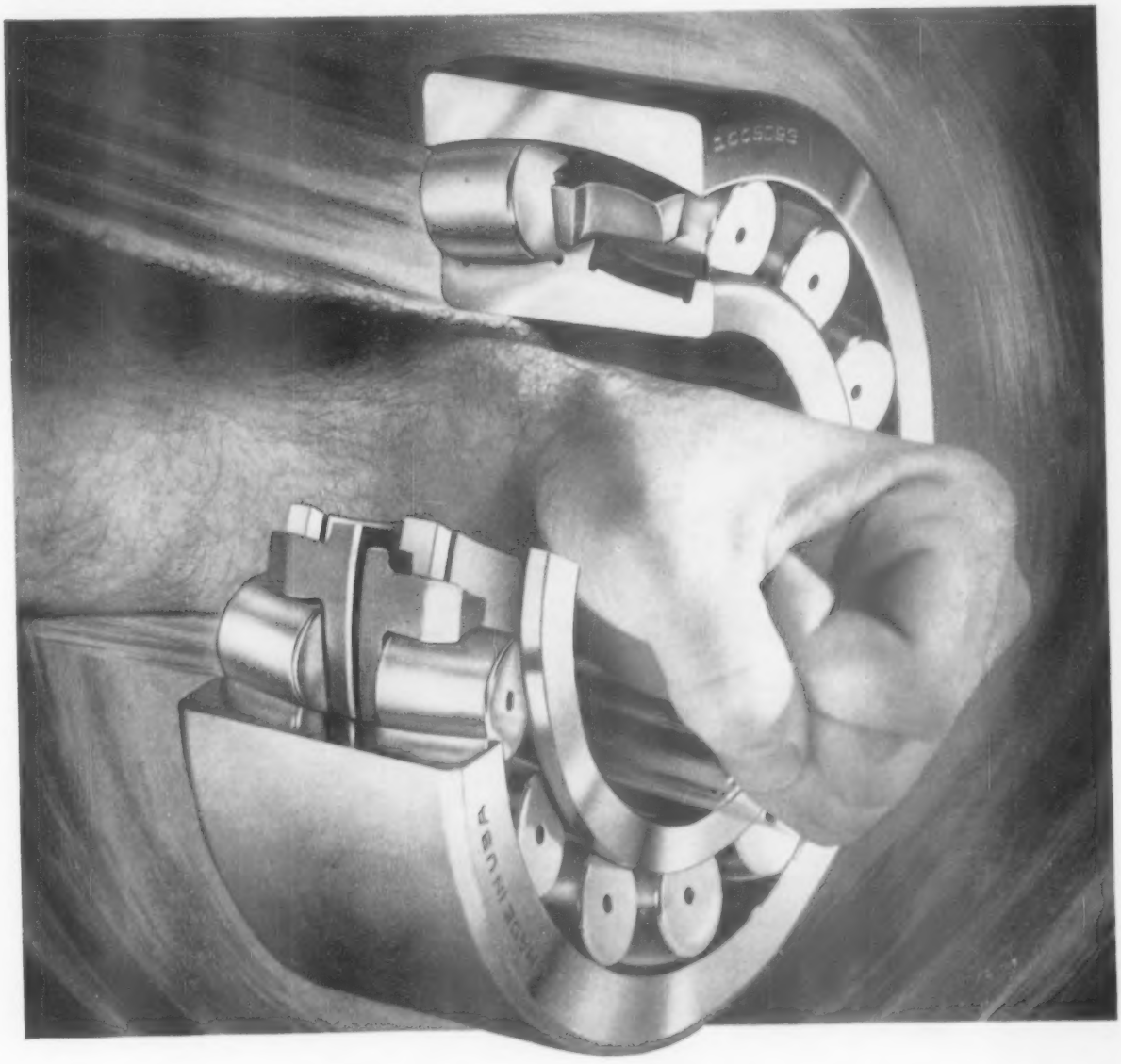
This statement is being given a great deal of circulation these days and, in some ways, paints an unfair picture of the attitude of the oil industry and its highway user customers. Basically, the fallacy in such a generalization appears to lie here:

(1) The national highway program is being advanced as a project which will benefit the entire economy and especially the national defense program. This would appear to suggest that it should logically be financed from general revenue paid by all the people—not by special levies on a single class.

(2) If, however, this point of logic is ignored and it is decided to assess the full cost of this program against the highway users as a group, then certainly some recognition should be given to the fact that the users—as a special group—are already paying more than $2,500,000,000 annually in federal excise taxes on gasoline, automobiles, trucks, tires, tubes, parts, and accessories.

In other words, if we say "the users should pay for the road program," we are obligated to add "every dollar the

# TORRINGTON *SPHERICAL ROLLER* BEARINGS



## This bearing can take thrust, too!

Design is the secret. TORRINGTON Spherical Roller Bearings are made with an integral center flange on the inner race. This assures *positive radial stability and accurate positioning of rollers* wherever high radial load and heavy thrust are encountered under conditions of misalignment.

From crushers to cranes, power shovels to pulverizers, you get long, maintenance-free operation, better performance in your equipment, more value from your bearing dollar when you specify these rugged dependable bearings.

Prove to yourself that TORRINGTON design does make a difference. Next time specify TORRINGTON Spherical Roller Bearings. They're available with either straight or tapered bore, for shaft or adapter mounting.

THE TORRINGTON COMPANY

South Bend 21, Ind. • Torrington, Conn.

*District offices and distributors in principal cities of United States and Canada*

90th ANNIVERSARY 1866 1956

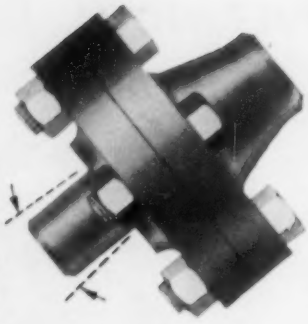
**TORRINGTON BEARINGS**

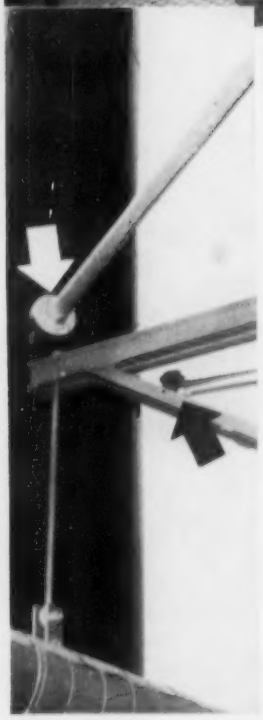
Spherical Roller • Tapered Roller • Cylindrical Roller
Needle • Ball • Needle Rollers

# HERE'S HOW

Refinery Engineers and Builders Use

# BARCO FLEXIBLE STRUT JOINTS





## —for Structural Applications

Barco Flexible Strut Joints are an important aid in *modern* refinery construction. A typical use is at the ends of struts for supporting or bracing large catalyst carrier lines or vent stacks on fluid catalytic crackers. In such cases, where horizontal lines require supports, two braces (with Barco Strut Joints in each) make costly "A" frames unnecessary. Other uses include guying tall vessels and columns and directing thermal movements of high temperature piping.

**SIMPLE, VERSATILE!**—The Barco Strut Joint is a dependable, compact, versatile fitting requiring practically no maintenance. It is a simple ball and socket that provides a point of flexibility. The close fit between ball and casing, allows for reversible loads, not possible with pin and clevis type braces. Barco Strut Joints support without restricting freedom of movement.

**COMPLETE LINE**—Available in following sizes and capacities: 1½"—8,000 lbs., 2"—12,000 lbs., 3"—20,000 lbs., 4"—50,000 lbs., 6"—130,000 lbs. Welding ends for field or shop use. Unique "Bar-Moly" treatment of wearing parts provides permanent dry lubrication for long service.

**ENGINEERING SERVICE**—Barco will be glad to work with your engineers in the selection of joints to meet your requirements. *Specifications and information on request.*

**SEND for your copy of interesting new illustrated bulletin No. 28 showing OIL REFINERY AND PETROLEUM INDUSTRY applications for Barco Ball, Swing, and Strut Joints.**

**BARCO** *Manufacturing Co.*

**539C Hough Street** • **Barrington, Illinois**


users are now paying should be taken into consideration in determining general fund appropriations for the road program before taxes are increased." If this were done, of course, any one of the programs so far advanced could be financed with no tax increase whatever.

This was the position taken by the Government's Conference in its discussion of the problem last summer.

This also was the position taken by the A.P.I. Board of Directors at San Francisco . . .

In other words, the point I'm trying to get across is basically this: It's not that nobody seems to want to pay for more highway, but rather that these highways are being paid for—and more—already. This, it appears to us, is the heart of the matter.

John H. Bivins
Director
American Petroleum Industries Committee
50 West 50th Street
New York, N. Y.

**Shale-Oil Prices**

Dear Sir:

In your January 23 issue, on page 43, there is an article relative to our method for retorting oil shale. I want to correct an error which appears in this article, because this error is attributed to me.

In the article there is a statement to the effect that the cost of oil shale will be reduced from 16 to 13 cents a gallon. It should have read that gasoline made from oil shale will be reduced from 16 to at least 13 cents a gallon.

By our pilot plant we anticipate proving that we can produce crude shale oil for less than $1 a barrel without any allowance for income from by-products.

H. E. Linden
President
Oil Shale Co.
Beverly Hills, Calif.

**Australia Underestimated**

Dear Sir:

As an avid reader of your Journal, I naturally pay particular attention to those articles relating to new developments in Australia. I would like to commend you for the coverage you have given which has provided us with valuable background on these developments in the "land down under."

In your report on world-wide oil, the December 26, 1955, edition, on page 176, there is a summary on oil in Australia. This, however, contains one error; namely, the figure shown for population—8,450,000. Now, all in

all, the Australians are a fairly prolific race. What with one thing and another, in 1955 the population level crossed the nine-million mark.

This was hailed appropriately by Australian leaders as a significant milestone in the growth of the country. I would like to suggest that perhaps you might revise the population estimate in your file index to reflect this happy event.

Ian McFarlane
Secretary-Treasurer
American Australian Association and Chamber of Commerce, Inc.
New York.

# CALENDAR

**FEBRUARY**

**24** Natural Gasoline Association of America, Permian Basin meeting, Lincoln Hotel, Odessa, Tex.
**26-29** American Institute of Chemical Engineers, Statler Hotel, Los Angeles.
**27-29** American Association of Petroleum Geologists, Rocky Mountain Section, Auditorium, Denver
**27-Mar. 3** International course on atomic energy, sponsored by National Industrial Conference Board, Westchester Country Club, New York.

**MARCH**

**1-2** Southern Gas Association, transmission management conference, Jung Hotel, New Orleans.
**7-9** American Petroleum Institute, Division of Production, Southern District meeting, Plaza Hotel, San Antonio, Tex.
**7-9** Society of Exploration Geophysicists, 9th annual midwestern meeting, Texas Hotel, Fort Worth.
**12-16** National Association of Corrosion Engineers, annual convention, Statler Hotel, New York City.
**19-21** Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, Tex.
**21-23** American Petroleum Institute, Division of Production, Southwestern District meeting, Texas Hotel, Fort Worth.
**24** North Texas Oil and Gas Association, annual meeting, Wichita Falls, Tex.
**29-30** American Institute of Mining, Metallurgical, and Petroleum Engineers, Dallas section, conference on economics and valuation, Statler-Hilton Hotel, Dallas.

**APRIL**

**2-3** Petroleum Engineering Conference on electrical and radioactivity logging, University of Kansas, Lawrence, Kans.
**3-5** Annual Corrosion Control short course, University of Oklahoma Extension Study Center, Norman, Okla.
**4-6** American Gas Association, general management conference, Conrad Hilton Hotel, Chicago.
**4-6** American Petroleum Institute, Division of Production, Mid-Continent District meeting, Broadview Hotel, Wichita, Kans.
**4-6** Society of Lubrication Engineers, eleventh annual meeting and exhibit, Wm. Penn Hotel, Pittsburgh.
**8-13** American Chemical Society, general meeting, Dallas.
**9-10** Texas Petroleum Research Committee, Ninth Oil Recovery Conference (Sym-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HAMER VALVES, INC.
Box 1851, Long Beach 1, California

Please send immediately a copy of your new Visible Wedge Bulletin.

Name_____
Company_____
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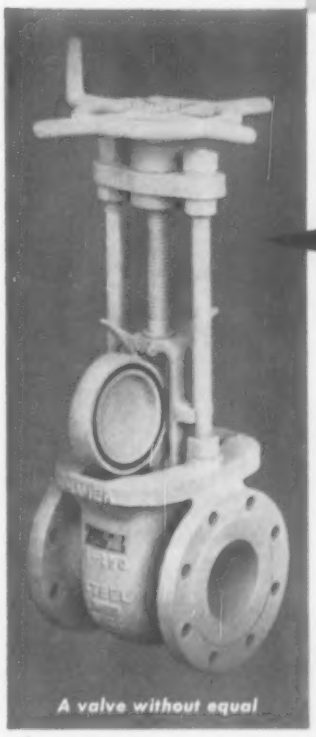
City_____ State_____ 4


A valve without equal

**New SURE-SEAL SHUT-OFF**
Combining precision metal-to-metal fit of wedge and seats augmented by dependable seal rings, the new Visible Wedge provides the impenetrable sealing action of a Line Blind, yet maintains the simplicity of operation found in a gate valve.

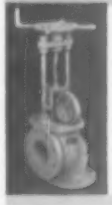
**The new Hamer Visible Wedge is available in Straightway, Tee, and Ell styles meeting all A.S.A. specifications.**

**New Hamer VISIBLE WEDGE**

***The finest positive sealing valve ever developed***

**New STABILITY**
Hamer Visible Wedge Valves are absolutely rigid. No line movement necessary to open or close valve.

**New SIMPLICITY**
"Full-view" wedge. One glance determines whether line is full open or full close.



**New SAFETY**
Operator has complete control of the wedge at all times. Wedge pivots—no hand lifting necessary.

Hamer **VALVES, INC.**
**2919 Gardenia Ave., Long Beach 6, California**
**Representatives Throughout the World.**

"I said we needed a powerful winch!"

In the fabulous Mid-Continent oil and gas area, Joe Roughneck does a bigger and better job year after year. Joe is the very heart of the industry . . . the composite spirit of the courageous men who invest time, money, and skill to find and produce the energy-fuels so vital to industry, national defense and the public. Joe's neighbor . . . Lone Star Steel . . . makes and delivers API casing, tubing, and line pipe for Joe's special convenience.

**Neighbor, wherever you are . . . specify Lone Star and we both get a good deal!**

**Lone Star STEEL COMPANY**

LSS

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posium on Natural Gas in Texas), Texas A. & M. College, College Station, Tex.

11-13 Natural Gasoline Association of America, Texas Hotel, Fort Worth.

14-15 Southern Gas Association, conference on use of electronic computers by engineering personnel, Hilton Hotel, El Paso.

14-18 Petroleum Equipment Suppliers Association, annual meeting, Boca Raton Hotel & Club, Boca Raton, Fla.

15-17 Texas Independent Producers and Royalty Owners Association, Statler Hilton Hotel, Dallas.

16-18 American Society of Mechanical Engineers, first Gas Turbine Power Conference, Hotel Statler, New York.

17 American Institute of Chemical Engineers, Philadelphia-Wilmington section —University of Pennsylvania, fourth annual meeting of "Experience in Industry" series.

17-19 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

18-20 American Petroleum Institute, Division of Production, Rocky Mountain District meeting, Cosmopolitan Hotel, Denver.

18-20 National Petroleum Association, semiannual meeting, Cleveland Hotel, Cleveland, Ohio.

19-20 Third Annual West Texas Oil Lifting Short Course, Texas Technological College, Lubbock, Tex.

19-21 Gas Appliances Manufacturers Association, annual meeting, The Greenbriar Hotel, White Sulphur Springs, W. Va.

23-25 Southern Gas Association convention, Dallas.

23-26 American Association of Petroleum Geologists and Society of Economic Paleontologists, annual meeting, Conrad Hilton Hotel, Chicago.

24-25 Pacific Coast Gas Association, Supply and transmission conference, Thunderbird Hotel, Las Vegas, Nev.

26-27 American Petroleum Institute, Division of Production, Eastern District meeting, Deshler-Hilton Hotel, Columbus, Ohio.

26-29 World Oil Exposition, Houston.

30

Jan 1 Independent Petroleum Association of America, semiannual meeting, Statler Hotel, Los Angeles.

30

Jan 4 American Petroleum Institute, Safety and Fire Prevention midyear meeting, Warwick Hotel, Philadelphia.

30-

May 5 International Course on Atomic Energy, sponsored by National Industrial Conference Board, Westchester Country Club, New York.

MAY

1-3 Petroleum Industry Electrical Association, annual meeting, Statler-Hilton Hotel, Dallas.

6-9 American Institute of Chemical Engineers, Roosevelt Hotel, New Orleans.

10-11 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Statler Hotel, Los Angeles.

10-11 American Gas Association, Gas Supply, Transmission, and Storage Conference, Conrad Hilton Hotel, Chicago.

14-15 American Institute of Mining, Metallurgical & Petroleum Engineers, Kansas regional meeting, Broadview Hotel, Wichita.

14-17 American Petroleum Institute, Division of Refining, midyear meeting, Montreal.

16-18 American Gas Association, Chemical,

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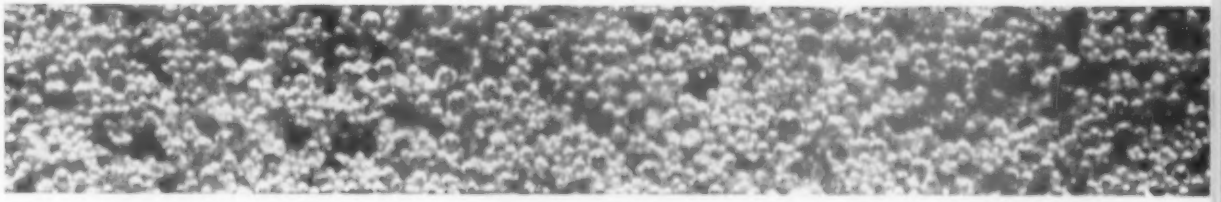

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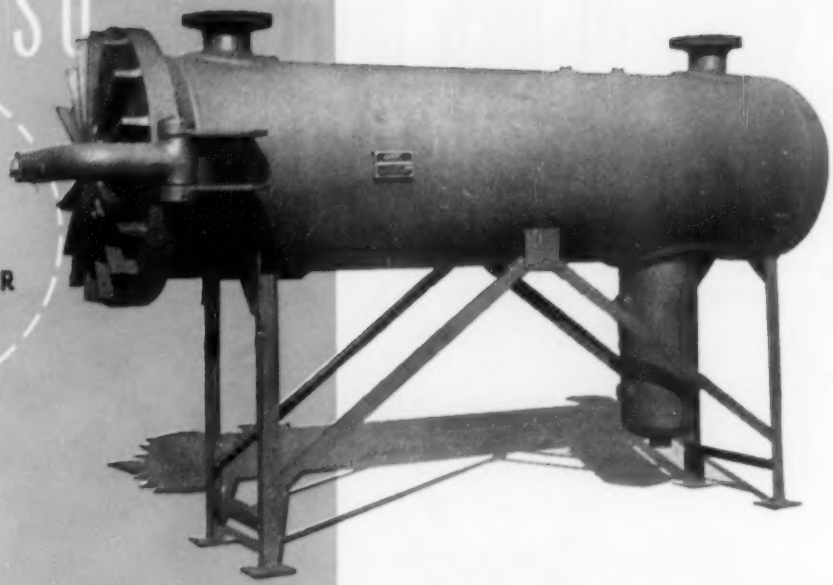

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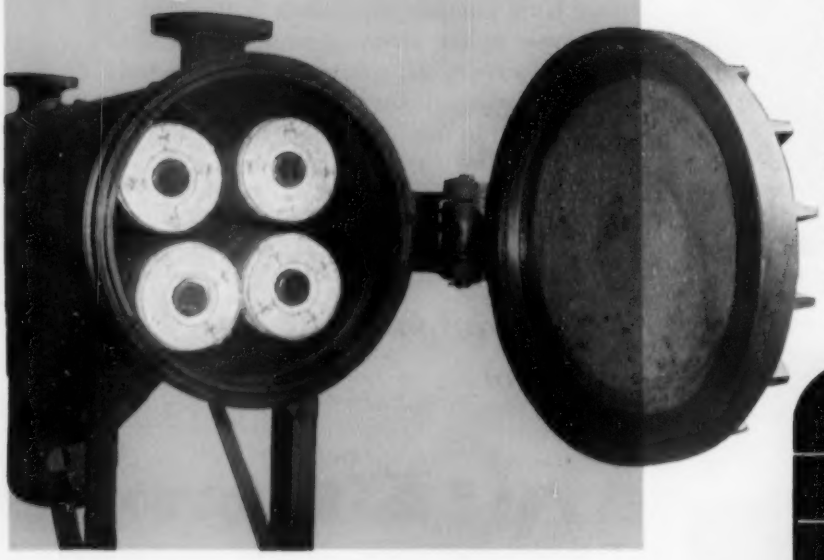

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Engineering, and Manufactured Gas Production Conference, Benjamin Franklin Hotel, Philadelphia.

17-18 Rocky Mountain Petroleum Sections, joint meeting, Gladstone Hotel, Casper, Wyo.

22-24 Pennsylvania Gas Association, Pocono Manor Inn, Pocono Manor, Pa.

24-25 Natural Gas and Petroleum Association of Canada, Sheraton Brock Hotel, Niagara Falls, Ont.

24-25 Kentucky Ojl and Gas Association, annual meeting, Lafayette Hotel, Lexington, Ky.

24-25 Western Petroleum Refiners Association, Michigan Regional Meeting, (location to be announced).

28-30 Chemical Institute of Canada, 39th annual conference and exhibition, Sheraton-Mount Royal Hotel, Montreal.

30-June 1 Texas College of Arts & Industries, eleventh annual short course in Gas Technology, Kingsville, Tex.

**JUNE**

13 Pennsylvania Grade Crude Association, thirty-third annual meeting, Bradford, Pa.

17-22 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Atlantic City, N. J.

17-23 World Power Conference, Vienna.

21-22 Western Petroleum Refiners Association, regional technical—industrial relations meeting, Broadview Hotel, Wichita.

24-25 Canadian Gas Association, Manoir Richelieu, Murray Bay, Que.

26-29 Canadian Gas Association, Manoir Richelieu, Murray Bay, Que. (see book).

28-30 Rocky Mountain Oil and Gas Association, board of directors, Hotel Utah, Salt Lake City.

**SEPTEMBER**

11-13 Pacific Coast Gas Association, annual meeting, Coronado, Calif.

13-15 Chemical Institute of Canada, third Western Regional Conference, Edmonton, Alta.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

**OCTOBER**

7-9 American Association of Oil Well Drilling Contractors, annual meeting, Texas Hotel, Fort Worth.

14-17 American Institute of Mining, Metallurgical & Petroleum Engineers, Petroleum Branch, fall meeting, Biltmore Hotel, Los Angeles.

15-17 American Gas Association, annual meeting, Atlantic City, N. J.

18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

29-Nov. 1 Society of Exploration Geophysicists, national convention, New Orleans.

**NOVEMBER**

12-15 American Petroleum Institute, Conrad Hilton Hotel, Chicago.

19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.

25-30 American Society of Mechanical Engineers, Statler Hotel, New York.


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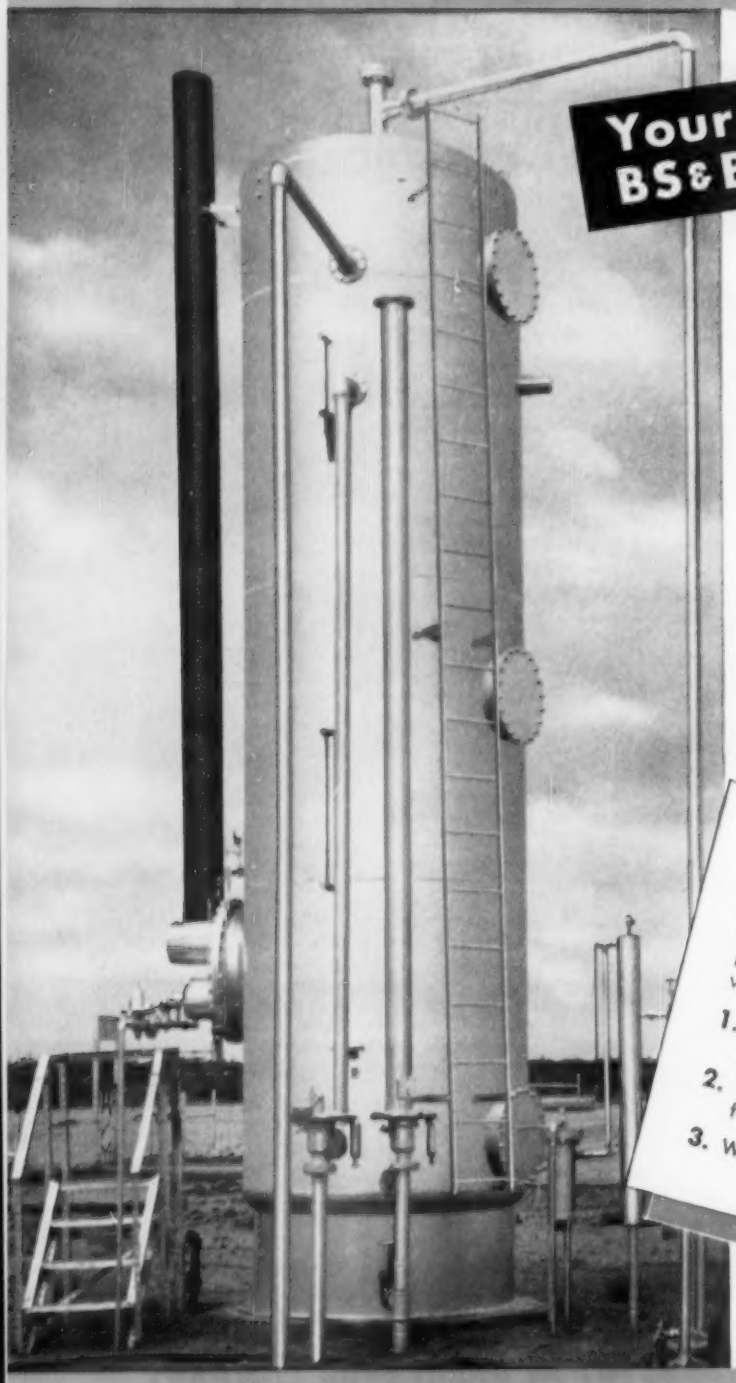

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TULSA, OKLAHOMA

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# JOURNALLY SPEAKING . . .

## Jet Conclusions

WE love to draw conclusions from little pieces printed close together—conclusions that probably are unwarranted and that certainly weren't intended by the person who arranged the page.

For example, a sheet of newspaper "fillers" distributed by the A.P.I.'s department of information contains these three items printed side by side:

No. 1. "Three hundred gallons of jet fuel are required to taxi a current jet bomber from the warm-up ramp to the end of a runway for take-off, usually a distance of about 1½ miles."

No. 2. "If a gallon of gasoline were stretched out a distance of 15 miles, it would make a tiny stream about the diameter of a hair from a horse's tail. Yet that thin thread of liquid can move a 3,000-lb. car 15 miles, with the whole family in it."

No. 3. "By the year 2000, nearly all the power used in transportation and agriculture is expected to be derived from internal-combustion engines burning petroleum fuels."

There you have it! Clearly a prediction that the jet engine is merely a passing fancy, on its way to oblivion already. Justified, too. For if a jet needs 300 gal. to go 1½ miles while a car can go 15 miles on 1 gal., quite obviously the internal-combustion engine stands a good chance of powering "nearly all" transportation in 2000 A.D.

So we're not going to get excited about any forecasts that our kids will be riding around in jet-powered cars and scooters in the brave new world of the future. Unless the engineers can cut down on a jet's fuel consumption quite considerably, we wouldn't be able to afford to back the family jet jalopy out of the garage. (And by the way, how would you back up a jet car, anyway? Our kids' comic books haven't explained that little detail).

But, unfortunately for us taxpayers, the U. S. Air Force is more interested in speed than in stretching its fuel supply as fine as a horse's hair. And that's why the demand for jet fuel may zoom up almost as fast as a jet fighter.

Which brings up the question of how the oil industry would supply all this jet fuel in case of a shooting war—and what we 15-miles-per-horsehair motorists would do for fuel in that circumstance.

Let's not think about it. Let's just assume, as did the writer of that third quotation, that civilization will still be around in 2000, that those voracious jets won't displace the less-hungry internal-combustion engines, and that there will be plenty of conventional petroleum fuels to power "nearly all" of transportation and agriculture.

## Shoestring Lawyers

THERE'S a lesson as well as a laugh in an incident relayed to us by Thomas M. Galey, an old-timer in Owensboro, Ky., who now and then sends us a little grist for this mill.

He says that back during the development of the Garnett shoestring pool in Kansas, some smart lawyer for a landowner didn't like the standard form of lease that the oil industry had developed, and thought he could improve on it. So he wrote in a provision that the operator had to drill a well every 6 months until the field was fully developed or surrender the undrilled acreage.

The tract was long and narrow and turned out to be right down the fairway of the shoestring pay. But the operator refused to drill offsets to producers brought in on both sides of his strip. He had a lawyer, too, and his lawyer said that the lease prohibited him from drilling more than one well every 6 months. Finally both operator and landowner fired their lawyers and signed a standard lease.

That's the laugh. The lesson is that lawyers (and others) unfamiliar with the nature of oil and gas and with industry practices can foul things up right when they try to lay down rules based on some new ideas or theory.

Somehow this incident reminds us of Washington, D. C., and of some of the suggestions originating there for regulating oil and gas.

—*Henry D. Ralph.*

# Like a bucket with a hole in it . . .

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# Are engineers short or do they fall short?

THIS week is being observed nationally as "Engineers' Week." It falls, curiously, at a time when many companies are complaining of a shortage of engineers and many engineers are complaining that they aren't properly appreciated.

As for the shortage, some observers think it is serious and will get worse unless drastic steps are taken. Others feel it is temporary and will be cured by the law of supply and demand, by the new attention now being given to science education, and by better use of engineers by industry.

Whatever the cause or cure, it is certain that the nation will always need more people—whatever their academic background—able to practice engineering in its broad, dictionary meaning: "The art and science by which the properties of matter and the sources of power in nature are made useful to man in structures, machines, and manufactured products."

FOR A COUPLE OF GENERATIONS the oil industry made a source of natural power useful to man without the aid of any engineers as such. The big rush to grab off science graduates is a phenomenon of the last few years. So, without meaning to underestimate the worth of technology, the thought may be ventured that perhaps an unrealistic value is being placed on an engineering degree.

What industry wants from engineers is what it wants from all its employes—ideas and results that will make money for the company and keep it competitive and progressive. Knowledge of the physical sciences is an important tool, but useful only when applied with imagination and horse sense.

Progress comes through a happy combination of creative thinking and the scientific approach to problems. Neither of these abilities is the exclusive prerogative of engineers. It is the job of management to team them up wherever they can be found.

By counseling at the high-school level, industry can interest more youths in science study whether or not they ever become engineers, and thus get future employes of various categories capable of grasping engineering concepts. In the meantime, industry can spread its present engineering and imaginative talent further by reappraisal of each individual's abilities and reassigning jobs accordingly.

ENGINEERS THEMSELVES can better their standing as a whole by behaving like professional men rather than like either big shots or wage slaves. They should stay out of management if management is not really their forte. They should dig out of ruts and routine jobs by giving imaginative suggestions.

Engineers' Week is a time to attack the alleged shortage—and alleged sad plight—of engineers from all angles.

Dowell service engineer controls each step in deepening drainage channels with Channeling Acid treatment.

# Operation for leveling decline curves

**Channeling Acid** has proved its effectiveness in smoothing out production decline curves–treatment after treatment.

For example, a well originally completed in a dolomitic limestone formation in 1939 was given a standard acid treatment in 1950. Tests indicated 15 BOPD pumping. In 1952 Dowell engineers recommended Channeling Acid to increase production. The treatment consisted of 1500 gallons of Channeling Acid followed by 10,000 gallons of silicate control acid. Production increased to test 114 BOPD pumping. *More than three years later the well is still an excellent producer, pumping its allowable of 38* BOPD.

Channeling Acid is an exclusive Dowell treatment that creates new passages for oil trapped deep in formations. Chemical agents make this possible by temporarily sealing off most of the pore spaces, allowing the acid to direct its attack on certain pores and form long drainage channels. The film-forming agents then break down and flow freely to the well bore.

For more information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write to Dowell Incorporated, Tulsa 1, Oklahoma, Dept. B-11.

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# The Industry This Week

**Production**

• **British-American breaks Oklahoma's prducing-depth** record with a prolific deep discovery in Grady County. The well flowed 30-40 bbl. of distillate an hour on drill-stem tests from 60 ft. of open hole bottomed at 15,310 ft. Producing depth is greater than in any state except Louisiana. P. 86.

**Texas oil producers aren't resting** in spite of their initial victory in the fight to prevent restrictions on production from water-flood projects. Their representatives are at every Railroad Commission hearing to protect water-flood interests. They also are assembling statistics for the expected shutdown with Humble, which wants proration for water floods. P. 94.

**Processing**

• **Refiners are watching Southern Pacific Railroad tests** of a dual-fuel system. It permits locomotives to switch from diesel to a cheaper residual-type fuel during medium and high load conditions. P. 84.

**Look for plant investment in petrochemicals to double by 1960,** totaling $8 billion. One economist thinks production will reach 60 billion pounds, representing one-third of all chemicals. P. 93.

**Drilling**

• **The next standard piece of equipment on the drilling rig** may be a cyclone drilling-mud classifier. The new device reportedly saves money through reduced drilling time, fewer bits used, longer pump life. P. 91.

**Economics**

• **Middle East crude prices have been changed** for the first time in over 3 years. New postings vary from a 5-cent cut at Persian Gulf head to 10-cent increase at Mediterranean ports. P. 102.

**Field prices for Denver-Julesburg crudes have been posted** for the first time. They'll be about $3.31 per barrel delivered at Chicago. The competitive picture is virtually unchanged. P. 96.

**Western Canada crude is invading the Michigan market.** New Inter-provincial Pipe Line tariffs make the crude available at West Branch and Alma, Mich. P. 89.

**Exploration**

• **Alabama soon will grant its first oil leases** under Mobile Bay. Gulf is expected to get one of the tracts and Stanolind six. P. 90.

**Socony Mobil has opened up first oil production** in south central Saskatchewan. The discovery is 28 miles north of the Montana border and is the first Bakken pay in the Williston basin. P. 97.

**Pipelines**

• **Gas interests in the Midwest** are moving to meet the threat of Canadian natural-gas imports. They plan a $148-million project to bring gas from the Rockies into the Chicago area. Involved is a $68-million big-inch line from Laramie, Wyo., to Beatrice, Neb., linking Colorado Interstate with Natural Gas Pipeline, and an $80-million expansion of Natural Gas' system from Beatrice to Joliet, Ill. P. 92.

**Trans-Canada has two new partners** to help finance its cross-country line. Canadian Gulf and Hudson's Bay Oil & Gas have paid $8½ million for 17 per cent interest each in the project. P. 95.

# Railroads May Adopt New Fuel Pattern

**D. H. Stormont**

LOS ANGELES.—Petroleum refiners as well as railroad men are following with interest tests of the Southern Pacific Railroad with a dual-fuel system on its diesel locomotives.

The new system allows a locomotive to switch from diesel to a residual type fuel during medium and high load conditions.

Preliminary tests reveal substantial savings on locomotive fuel bills. Now the fuel system is being tested on a fleet basis in the railroad's northern California division.

Refiners have a stake in the tests because they may change the fuel pattern of railroads, with these possible effects:

. . . **Less demand for diesel** fuel and more for residual.

. . . **More straightrun distillates,** thus would be made available to refiners for other markets or as feed for cat cracking units.

. . . **Price of residual** might rise. Railroads would be competing for a fuel whose price pattern previously was set by its relative value to industrial users or to the refiner for coking units or asphalt plants.

**Low cost big lure . . .** Southern Pacific is encouraged by the tests so far.

The first experiments with a dual-fuel system were begun a year ago. Their success led the railroad to order new systems for 50 additional units. Fifteen of these are now in use on main-line freight locomotives and the remainder soon will be.

Lower cost of the residual blend cuts any fuel bill substantially from what it would be if straightrun distillate fuels were used. An additional 5 per cent cut is possible because of the higher heat content of the low-gravity, high-sulfur fuel.

Though they are not expected materially to change the lower-cost picture, maintenance expenses may be higher. Sufficient experience has not been logged to determine just how much.

The test program with residual fuels is only one phase of the company's search for a more economical fuel. Most experience with the dual-fuel system has been with residual blends—due to their greater cost advantage. But the system is equally applicable to high viscosity or high pour-point distillate fuels.

**Much at stake . . .** Two factors provide the big incentive behind the extensive search by major railroads for a more economical diesel fuel:

. . . **Fuel costs** account for more than 50 per cent of the average railroad's expenses in running a locomotive exclusive of wages paid to crews of trains.

. . . **Constant increase in diesel** consumption as railroads approach complete dieselization has compounded the cost burden.

Railroads, however, account for only a small portion of the total middle distillate market. Further, consumption of heating oil is rising much more rapidly than that of the railroads.

In 1950 railway diesel fuel sales of 45,000,000 bbl. amounted to 11.4 per cent of total distillate fuels market. Heating oils sales accounted for 56 per cent. During 1955 estimated railway distillate consumption was 83,000,000 bbl. but heating oils had gained to an estimated 340,000,000 bbl.

Insofar as diesel fuels are concerned, however, railroads are by far the oil refiners' biggest customer. Last year they accounted for about 45 per cent of the total diesel fuel consumed. By 1960, when a total consumption of 215,000,000 bbl. is anticipated, railroad diesel fuel usage will account for 50 per cent.

The increased competition for middle-barrel products has caused the railroads to turn more and more to cracked distillate fuels. Instead of the 50 cetane straightrun fuel formerly used exclusively, lower cetane, higher sulfur fuels now are being burned by some railroads.

This is reflected in a survey of 28 Class I railroads carried out last year by the fuels committee of the Association of American Railroads. As shown in the accompanying table below, 45-cetane fuels during 1954 accounted for 17 per cent of the total reported.

East of California a standard fuel has a cetane of 50 or above, a sulfur content of 0.5 per cent or less, and an end boiling point under 700° F. On the West Coast, where more cracked distillates are used because of the lower gravity crudes available, a standard fuel may have a cetane number of only 42. The sulfur content runs about 0.75 per cent and the end point may be as high as 725° F.

**S. P.'s program . . .** In mid-1953, Southern Pacific started an investigation to determine:

**. . . The immediate economic advantage** in using cheaper fuels.

**. . . Types of fuels** which could be satisfactorily used if a national emergency forced it to use lower grade fuels.

First work was with cracked diesel fuels and blends of straightrun and cracked stocks. Storage and filtration problems increased, and there were other troubles. But it was found the low quality cracked distillates gave very good engine performance. Selected additives helped reduce the storage and filtration problems.

Accordingly in mid-1954 the company adopted all-cracked or blends of straightrun and cracked distillates as the standard fuel for all locomotives. The exceptions were those which take tank-truck delivery at outlying points. This switch resulted in its fuel bill being reduced appreciably.

A variety of blends or all-cracked fuels are used, with the general specifications of: Viscosity (S.s.U. at 100° F.), 33 to 50 sec.; minimum cetane number, 34; maximum sulfur, 1 per cent; pour point, 25° F. in summer and minus 5° F. in winter. Total for the carbon residue plus sulfur is limited to 12 per cent.

Not satisfied with this savings, Southern Pacific then investigated residual fuel blends. These offer a 20 to 60 per cent reduction from the cost of straightrun distillates.

Many characteristics of conventional locomotive diesel fuels are based on properties required for idling and low output operations. But main-line locomotives operate at low-load conditions only a fraction of the time. Consumption during this period amounts to only a small percentage of the total fuel used. This suggested that a dual-fuel system using light fuel for idling and low-load conditions, and heavy fuel for high and medium loads, might be the answer.

## How Much Diesel 28 Railroads Bought In 1954

| Group— | Cetane number: 50 and over | 45 to 49 | 40 to 44 | Below 40 | Total (gal.) |
|---|---|---|---|---|---|
| Eastern | 180,800,637 | 562,800,429 | 37,940,593 | 54,499,860 | 836,041,519 |
| Southern | 133,521,595 | 260,073,033 | 7,000,000 | 316,651 | 400,911,279 |
| Western | 394,231,761 | 116,279,556 | 94,903,962 | 3,729,185 | 609,144,464 |
| Southwestern | 137,440,815 | 59,440,465 | 12,867,086 | | 209,748,366 |
| Far western | 136,770,277 | 67,594,916 | 33,578,622 | 155,129,124 | 393,072,939 |
| Total | 982,765,085 | 1,066,188,399 | 186,290,263 | 213,674,820 | 2,448,918,567 |

Type of residual fuel selected was decided upon by the maximum viscosity which could be reduced to a suitable injection viscosity by heat exchange with the 160° to 185° cooling water. With this as the control point, it was decided a residual blend having a viscosity of 300 S.s.U. at 100° F. was the logical fuel to work with. When heated to about 160° F., viscosity at the injector is approximately 80 seconds.

**Dual-fuel system . . .** Heart of the system is the two fuel control valves.

The entire mechanism is controlled by a governor relay which automatically switches the fuel feed from distillate to residual between the fourth and fifth throttle positions.

A time-delay mechanism prevents the switch from distillate to a residual fuel during movements around the yards. There is also a time-delay on the return selector valve. This prevents contamination of the distillate fuel tank with residual when reducing throttle positions. The entire system is electrically actuated and air operated.

Residual fuel, carried in a 1,100-gal. insulated tank, is circulated through the heating and filtering system at a 240 gal. per hour rate. This is approximately three times as much fuel as the engine requires at full throttle. By so doing a temperature of about 100° F. is held in the storage tank.

A standard sock-type filter is used as a primary element and a resin-impregnated paper is used as a secondary filter. Experience to date has been that the filters do not require changing any more frequently than when operating on distillate fuels.

The regular distillate fuel is stored in a 400-gal. compartment of the main fuel tank. It passes through a conventional filter before being fed to engines.

**Over-all economics . . .** Value of the two-fuel system is indicated by the fact that consumption of distillate fuel is cut to about 10 per cent.

Instead of operating full time on a straightrun distillate which generally costs about 10.3 cents per gallon, or on a 50-50 blend of cracked and straightrun fuel worth about 9 cents, approximately 90 per cent of the fuel consumed is light residual costing some 7 cents per gallon.

The residual-type fuel being used in current fleet tests contains up to 50 per cent cracked distillate. Its A.P.I. gravity is in the range of 16° or 17°, sulfur content is 2.5 to 3 per cent, and the calculated octane number is about 25. Over-all characteristics of the blend are in the range of the grade known as "Navy special," a fuel readily available in many areas. No additives are used.

One of the advantages of the lower-gravity residual fuel is its higher volumetric heat content. Theoretically, the higher B.t.u. content of 17°-gravity residual oil, 148,000 B.t.u. per gallon, as compared with 143,000 for 36°-gravity distillate fuel, would result in increased mileage or horsepower of about 3.5 per cent.

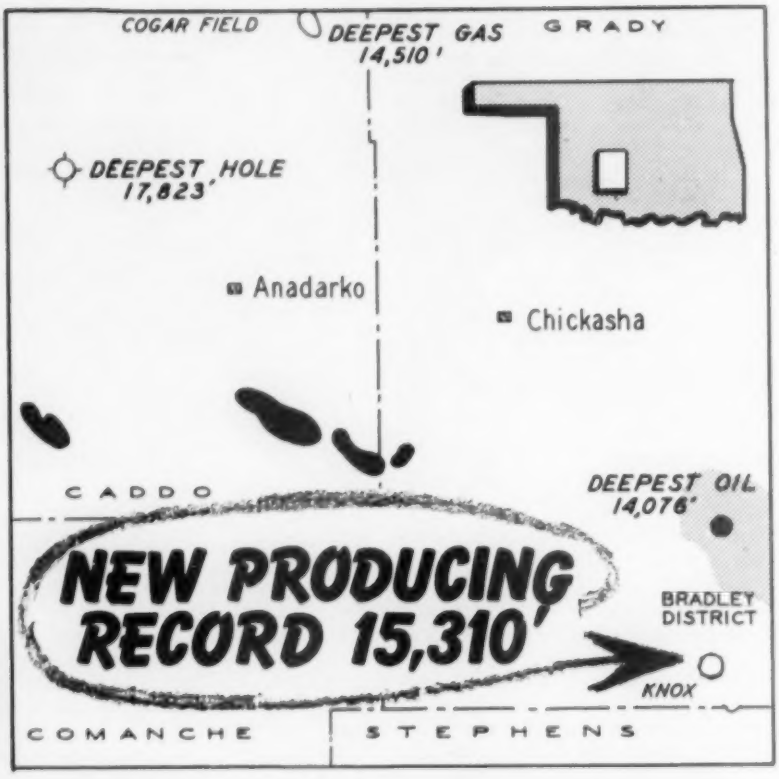
**Residual troubles . . .** Greatest difficulty involved in the use of residual fuels was expected to center around the injector spray tips. But so far this has not been much of a problem.

Continued examination of the injectors shows the amount of deposit forming reaches an equilibrium in a relatively short time, and does not become any more severe after extended service. This is attributed partially to the alternate use of distillate fuel, which results in cleaning the tips and keeping the fuel system purged.

Sufficient experience has not been compiled to determine fully the effect of the residual fuel's high sulfur content on engine wear and deposits. Because the fuel is burned only at medium and high loads, high engine temperatures tend to keep condensation and crankcase dilution to a minimum.

Continued operation may develop certain maintenance problems, such as wear of piston rings and valves. But observations after months of service have failed to reveal any serious difficulties.

Much more testing will be required before the majority of locomotive diesel engines are equipped to handle light residual fuels, or heavy cracked gas oils. Southern Pacific's work with the dual-fuel system, however, is a big step toward increasing the range of fuels which can be satisfactorily used in diesel locomotives.




# Oklahoma Producing Depth Record Set

CHICKASHA, Okla. — The closely watched deep test of British-American Oil Producing Co. in Grady County was completed last week as Oklahoma's deepest producer.

The record breaker is the 2 Harrison, in shallow Knox field. It was completed February 14 flowing oil and gas prolifically from open hole between 15,250 and 15,310 ft. in Ordovician Bromide sands.

Flow rates were 30 to 40 bbl. of distillate an hour and 5,500,000 cu. ft. of gas daily.

Previous deepest production in Oklahoma was gas from the Hunton lime at 14,510 ft. in Cogar field of Caddo County. This well was completed in 1948 (see map).

Oklahoma's deepest oil well was in the Bradley area of Grady County, producing from 14,076 ft. in the Tulip Creek sand.

**Reserves "large" . . .** The 2 Harrison found oil and gas in nearly 300 ft. of the Bromide sands, and British American geologists are marking up the new reserves of both oil and gas as "potentially very large."

Pressure data from the well tend to verify this. Bottom-hole shut-in pressure was last gaged at 9,450 psi.

The 2 Harrison erased another record on the way down by cementing successfully 14,931 ft. of 7-in. casing. The 470,000-lb. string of pipe was the longest ever run in Oklahoma.

The open-hole producing interval is identified as the Third Bromide sand. Cased off behind the 5-in. liner is a zone in the Second Bromide at about 14,997-ft. sand, which earlier drill-stem tested an estimated 13,750,000 cu. ft. of gas a day. British-American has no plans to perforate the liner and produce this zone in the near future.

**Big exploration news . . .** The discovery is regarded as one of the most significant strikes in recent years in Oklahoma.

It is sure to encourage many geologists who have felt for a long time that many of southern Oklahoma's structures will produce from deep Ordovician sands—if oil companies will gamble against the heavy costs and risks.

British-American geologists feel, as a matter of fact, that oil and gas in even larger quantities probably will be found in the prolific McLish and Oil Creek sands which lie still deeper. Tests of these structures are being planned for the future.

But such enormously costly drilling, British-American says, must await adoption by the Oklahoma Conservation Commission of more favorable spacing regulations for wells producing from such depths.

**Mixed-up geology . . .** British American geologists expected to hit the Bromide sands at about 13,500 ft.

They were right on the button down to 10,000 ft. There the well topped the first of five thrust faults, and actually drilled through the same formations five times. This added 2,000 ft. and $200,000 to depth and cost of the hole.

The thrust-faulted formations were the Springer sand of Pennsylvanian age and the Caney and Mayes of the Mississippian.

Completion of the well netted British-American a half interest in about 2,600 acres owned by the Ohio Oil Co., which held the leases by virtue of shallow production established in Knox field years ago. British-American owns full interest in another 2,000 acres of leases in the area.

The deep test was spudded June 14, 1955, took exactly 8 months to complete, and cost $700,000.

Rig on the project was Big Chief Drilling Co.'s heavy-duty number 30.

## Wage Hikes Spread

### ● West Coast, Canadian firms join in offering 6 per cent salary raises

THE oil industry's current round of wage increases has spread to the West Coast and Canada.

Standard Oil Co. of California started the West Coast wage move last week and was followed by Shell Oil Co., Tide Water Associated Oil Co., California Oil Co., Continental Oil Co., and The Texas Co. Yet to announce a new wage policy are Richfield Oil Corp. and Union Oil Co. But prospects are good that they will follow soon.

Terms of the increases offered are a basic wage increase of 6 per cent with a 15-cent an hour minimum for daily paid workers and $26 a month for salaried employes. Shift differentials in most cases are raised to 8 and 16 cents.

These are similar to offers made east of the Rockies 2 weeks ago. It also was on this basis that the first local of Oil, Chemical and Atomic Workers International Union signed last week with Magnolia Petroleum Co. for the Beaumont refinery *(The Oil and Gas Journal, February 13, page 79).*

California Standard made its offer to unorganized employes and to bargaining agents of union-represented personnel. It is retroactive to February 1.

Meanwhile, O.C.A.W. officials on the Gulf Coast report other union locals there have been offered terms similar to those signed at Magnolia's Beaumont plant. Offers reportedly came from Stanolind Oil Purchasing Co. at Beaumont, American Oil Co. at Texas City, and from The Texas Co. and Houston Pipe Line Co.

**Canadian raises . . .** Two major firms operating in Canada also have granted the 6 per cent wage increase.

Mobil Oil Co. of Canada, Ltd., kicked off the move and was followed quickly by Imperial Oil, Ltd. Most observers believe the rest of the Canadian industry now will do the same.

Previously members of the O.C.A.W. in Saskatchewan won 6½ per cent general pay increase. Oil workers generally in northern Alberta, British Columbia, and Saskatchewan are union members while most of those in southern Alberta are unorganized.

The Saskatchewan wage boost was negotiated with Royalite Hi-Way, Ltd., Consumers' Cooperative Refinery, and British American Oil Co., Ltd. Under its terms refinery operators now will average from $2.50 to $2.54 an hour.

## watching WASHINGTON

**. . . with Bertram F. Linz**

### Aftermath of gas fight: new oil probes . . .

THE bitterness of the fight over the Harris bill will be a long time dying out.

Before it fades there will be new investigations of the oil industry, new demands for federal regulation, and new tries at cutting the depletion allowance.

The $2,500 campaign contribution offered Sen. Francis Case of South Dakota—a badly timed move if nothing worse—is leading toward an all-out probe of the political activities.

Coupled with this may be an investigation of lobbying. Both sides in the gas fight engaged in it in a big way. "Spontaneous" public reaction was voiced in a deluge of messages which reached senators as they prepared to vote. But the identical wording of thousands of messages robbed them of any weight they otherwise might have had and revealed they were part of organized campaigns.

Other studies may result from charges of monopoly in the industry and pleas of a need to regulate it.

The first of what may be a series of bills to cut the depletion allowance appears to have been prompted by the gas fight. Sen. John J. Williams of Delaware revived the bill he first offered 2 years ago. Williams voted for the Harris bill, but three Republican cosponsors from New England did not.

### Uncle Sam counts up his real estate . . .

BETTER than one out of every five acres of land in the continental United States belongs to the federal Government.

The first complete listing of the Government's real estate holdings has just been completed. It shows that Uncle Sam owns 407,900,000 acres of land, most of which is in the public domain. But some was bought at a cost of $2,400,000,000. He also has 385,000 buildings with 2,196,000,000 sq. ft. of floor space which cost $14,475,000,000, and 11,777 defense and other "installations" costing $15,629,000,000.

The total investment, again not counting the public lands, adds up to a neat $32,473,000,000.

The Government owns 364,800,000 of the 753,400,000 acres in the 11 states of Nevada, Utah, Idaho, Oregon, Wyoming, California, Arizona, Colorado, New Mexico, Washington, and Montana. That is 89.4 per cent of all U. S. lands.

The report does not cover holdings in Alaska. They, with properties in Hawaii and other possessions, are now being listed and a report will be made next month.

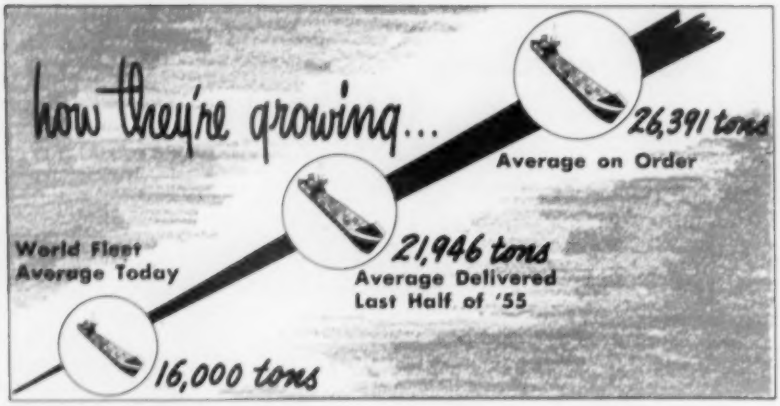
### U. S. to try oil "overcharge" case . . .

THE Justice Department is getting ready for trial of its 4-year-old complaint that six oil companies overcharged the Government for Middle East oil shipped to Europe under the Marshall Plan.

The Government originally sought to recover $100,000,000 from Standard Oil Co. of California, The Texas Co., Bahrain Petroleum Co., California-Texas Oil Co., Caltex Oceanic, Ltd., and Mid-East Crude Sales Co. That was the amount, it said, by which the companies had overcharged on shipments between April 1948 and September 1952.

The new complaint is limited to oil shipped after August 1950. The Government admits that shipments prior to that time were specifically approved by the European Cooperation Administration.

The amount of the alleged overcharge is reduced substantially from $100,000,000. But another count in the complaint cites a provision of the ECA regulations that in the event of violation, the Government could refuse to make any payment at all. That could increase the amount to be recovered to $200,000,000.




# Tankers Getting Bigger

## Oil companies move ahead of tramp owners in new orders placed for tankers of 30,000 deadweight tons and over

OIL companies, which long had lagged behind tramp owners in the purchase of big tankers, have now taken over the lead.

As the result of heavy orders placed in shipyards around the world during the last half of 1955, oil companies now hold the majority of orders for big crude and products carriers—those 30,000 deadweight tons and over.

According to John I. Jacobs & Co., Ltd., of London, of 230 vessels of 30,000 tons or more on order, 126 are being built for oil companies, and 104 for tramp owners. Oil firms also are building a greater share of the total new tanker tonnage, although they still trail tramp owners. Out of 14,320,000 tons on order at the end of 1955, 41 per cent was placed by oil companies. A year earlier, companies accounted for 34 per cent out of 8,955,000 tons on order.

**Tankers getting bigger . . .** Although giant supertankers have taken the spotlight in recent months, the increase in the size of the average tanker in service may have a more important effect on day-to-day oil movements.

The existing fleet of ships of 5,000 tons or more averaged 16,158 tons per tanker on December 6. New tankers delivered during the second half of the year averaged 21,946 tons. Vessels on order average 26,391 tons.

In comparison, the average deadweight of the fleet a year earlier was 15,469 tons. New ships delivered the last half of 1954 averaged 21,996 tons, and ships on order at the end of 1954 averaged 23,144 tons.

The largest tankers now planned are two 83,000-ton ships to be built in a Japanese shipyard leased by American tramp owners. The Japanese Government reportedly has given its approval. It's understood that the project is dependent on a sufficient steel supply.

The most noticeable trend, however, is for the large amount of orders between 33,000 and 45,000 tons. A table prepared by Jacobs & Co. compares ships of 24,000 tons and over now in service with tankers on order. The proposed 83,000-ton ships are excluded:

| Deadweight— | In service | On order |
|---|---|---|
| 24,000 to 32,999 | 229 | 163 |
| 33,000 to 37,999 | 7 | 71 |
| 38,000 to 44,999 | 11 | 46 |
| 45,000 to 49,999 | 4 | 4 |
| 50,000 and over | | 5 |

The remaining orders for new ships include 239 vessels ranging from 16,000 to 21,500 tons. Most of these are in the 18,000 to 19,500-ton class, and 15 are of smaller sizes.

**Capacity per ton rises . . .** Because bigger tankers carry more oil in proportion to their deadweight, and because faster tankers of the same class can deliver more oil over a period of time, the capacity of new ships is out of proportion to their size.

Considering the world commercial fleet on the basis of ships 10,000 tons or more, tankers on order amount to about 35 per cent of the total tonnage in service. But the actual carrying capacity of vessels on order is about 45 per cent of the present world total.

The 10 to 15-year-old group includes all the wartime T-2 tankers. These account for about 31 per cent of the tonnage and 28 per cent of the carrying capacity. Although all T-2's were built within a short period, it is unlikely that they will have to be replaced at about the same time. Some T-2's have been chartered for 5 years beginning in 1956 and 1957, indicating that the replacement problem for most of the type will not begin until at least 1963.

**Present fleet size . . .** Eighty-five new tankers totaling 1,659,145 tons were added to the world fleet during the last half of 1955. This figure virtually equaled new construction during the first half of the year. But the 1955 total fell off 1,450,000 tons from the peak 1954 year.

Tankers flying the United States flag continued to lead the world fleet in tonnage, but there was a decrease of around 150,000 tons. The United States had 19.81 per cent of the fleet total, off from 20.72 per cent in June 1955. Most of the United States decrease was due to transfers to the Liberian flag.

To show a more realistic relationship between the various fleet sizes, Jacobs & Co. computed the carrying capacity of major charters in terms of T-2 tankers. The figures exclude ships of 10,000 tons or less, which are government operated, or are otherwise not available for commercial service. The table adjusts tanker size and speed in terms of T-2's.

| Charter country— | Actual tankers | Deadweight tons | T-2 equivalent capacity |
|---|---|---|---|
| United States | 520 | 8,130,035 | 370.3 |
| Britain | 537 | 7,479,279 | 371.4 |
| Norway | 399 | 6,295,372 | 363.4 |
| Liberia | 185 | 4,104,598 | 264.2 |
| Panama | 184 | 3,169,043 | 187.3 |
| France | 114 | 1,881,538 | 107.2 |
| Italy | 119 | 1,770,467 | 97.9 |
| Netherlands | 115 | 1,376,447 | 69.0 |
| Sweden | 77 | 1,240,534 | 73.7 |
| Japan | 57 | 1,240,534 | 55.1 |

**Outlook for charter rates . . .** Although conditions can bring about a temporary shortage of tankers on occasion, there is no reason why the present fleet and scheduled additions should not meet the oil industry's long-range needs. The tanker fleet will grow about 10 per cent a year for at least 5 years, while forecast increases in world oil demand are around 6 per cent per year.

Commenting on the pre-Christmas boom which sent single voyage rates to about scale plus 200 per cent from the Persian Gulf and plus 165 per cent from the Caribbean Sea, Jacobs & Co. said: "There is justifiable reason to question whether there has at any time been a sufficiently acute tonnage shortage to warrant rates having risen so high, and this may partly be attributed to what might almost be termed panic actions on the part of some of the smaller and less experienced charterers."

# Texas-Florida Line Firmed Up

**● McAllen, Tex.-Miami project would cross over the last major frontier for natural gas left in the United States**

WASHINGTON.—The long-developing plan to bring Texas and Louisiana gas to Florida is now before the Federal Power Commission.

Applications of Coastal Transmission Corp. and Houston Texas Gas & Oil Corp., both of Houston, call for a 1,526-mile, big-inch system from the lower Rio Grande Valley to Miami.

The companies plan to transport 350,000,000 cu. ft. daily to the nation's last major undeveloped natural-gas market. Cost of the combined projects would be $165,641,000.

**Current Florida situation . . .** The natural gas which is proposed for sale in Florida is almost five times the volume of all gases now being consumed there.

In 1954, gas sales totaled 73,200,000 cu. ft. daily, of which 62,000,000 was natural gas, 10,000,000-plus manufactured gas, and about 1,000,000 L.P.G. Natural gas has been limited to the northern part of the state.

The principal market has been industrial uses, which account for 51 million cubic feet daily of natural gas. Residential consumption of all gases is only 10.5 million cubic feet daily. Industry customers also will take the lion's share of the Texas and Louisiana natural gas. Domestic and commercial markets are limited by the mild climate and the fact that it will take time to expand distribution systems. But natural-gas will have to complete with entrenched coal and fuel oil for the industrial market. Part of this market is sewed up by long-term contracts.

**Coastal plans . . .** Coastal Transmission, subsidiary of Delhi-Taylor Oil Corp. of Dallas, asked FPC authority to build 565 miles of 22 and 26-in. main line.

There would be 272 miles of smaller-diameter laterals tying into 20 gas fields. Four trunk-line compressor stations would have an aggregate of 26,000 hp.

The western terminal would be near McAllen, Tex., a few miles from the Mexican border, and the connection with the Houston Texas system at Baton Rouge, La. Pipe Line Technologists, Inc., has done preliminary engineering for Coastal. Under a 20-year service contract with Houston Texas Gas & Oil, the gas is to be transported and marketed to industrial and residential customers in 57 Florida cities and towns.

**Houston Texas project . . .** The Houston Texas pipeline, brainchild of the late J. O. Mack, would run 961 miles from Baton Rouge to below Miami.

The amended application just filed calls for five compressor statitons totaling 42,000 hp. along the 26-in. line. Cost is estimated at $106,836,000.

This application amends an oft-revised scheme submitted to the FPC last August *(The Oil and Gas Journal, September 5, 1955, page 82).*

Gas supplies are to come from Delhi-Taylor, Sun Oil Co., Superior Oil Co., M. H. Marr Co., Continental Oil Co., Atlantic Refining Co., Gulf Oil Corp., Richardson & Bass, General Crude Oil Co., and Shell Oil Co.

**How plans developed . . .** Projects now before the FPC are the upshot of several other paper schemes which never got off the ground.

The original Coastal Transmission plan reportedly envisioned importing gas from northeastern Mexico.

The Houston Texas pipeline has been 3 years in the making. The company, originally headed by J. O. Mack, first planned 30-in. lines from the lower Rio Grande to Chicago and from South Louisiana direct to New York.

Signals were switched several times before the current project hit the FPC hopper last August. Mack didn't live to see any of his plans bear fruit. He died in May 1955. F. E. Stanley, president of Midwestern Constructors, Inc., Tulsa, now heads the company.

# Canadian Oil Enters Michigan

**Refiners turn to western Canada not for cheaper crude but because U. S. supplies aren't adequate for demand**

CALGARY.—Interprovincial Pipe Line Co. has announced combination tariffs which will make Western Canadian crude oil available at West Branch and Alma, Mich.

It is understood that contracts have been entered into by Imperial Oil, Ltd., which will result in the delivery of up to 10,000 bbl. daily of Alberta crude to Michigan refineries. One of the buyers will be Leonard Refineries, Inc., at Alma.

This will be the first crude oil from Western Canada to be delivered to Michigan refineries. It marks the entry of the Canadian crudes into a new United States market which is expected to expand during the year.

The new Interprovincial tariffs, including Lakehead Pipe Line Co., Inc., in cents per barrel are:

| | Destination | |
|---|---|---|
| Crude source— | Alma, Mich. | W. Branch, Mich. |
| Redwater, Alta. | 75 | 61½ |
| Edmonton, Alta. | 73 | 59½ |
| Kerrobert, Sask. | 67 | 53 |
| Regina, Sask. | 61 | 47½ |
| Cromer, Man. | 59 | 43½ |

It is understood that only Edmonton crude is involved in present agreements because the other crude oils with the new tariffs are not available at this time.

**Price breakdowns . . .** The price at Edmonton is $2.635. This includes the field price plus 12 cents gathering and 1.3 cents pipeline allowance minus 1.8 cents equalization. The equalization includes adjustments for sulfur and gravity. The crude is 36.5° A.P.I. gravity.

To the Edmonton price is added the 73-cent pipeline tariff and 2.7 cents for trunkline allowance plus a 10½-cent import duty, making a delivered price at Alma of $3.497 per barrel. The West Branch delivered price is $3.362 per barrel.

The Alma tariff includes the charge from Bay City to Alma by the Michigan-Ohio Pipe Line Co., which operates a gathering and delivery system in that part of Michigan. The West Branch terminal on the Lakehead system is about 4 miles of the town of West Branch and near several independent refineries.

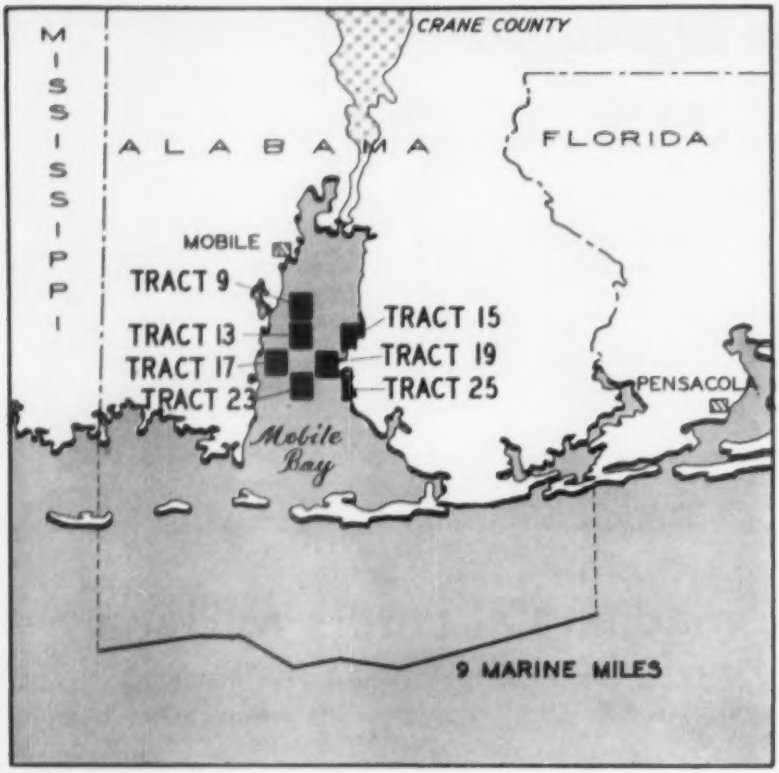
**Comparison with U. S. crude . . .** Canadian crude delivered at Alma and West Branch isn't undercutting U. S. crudes. The Mid-Continent price for 40° and above gravity at Alma is $3.53 per barrel. The Illinois basin crude is $3.43.

The incentive in buying western Canada crude is this:

**. . . Michigan output is declining** in the face of constantly expanding refining capacity in the state.

**. . . Illinois basin crude is not** now available in sufficient quantities.

**. . . Lack of available pipeline** capacity in Michigan for the Mid-Continent and Illinois basin crude oils is also a factor in the tight crude-oil market situation there.




***Stanolind top bidder as . . .***

# . . . Mobile Bay Play Near

MONTGOMERY, Ala. — The Alabama Department of Conservation has recommended that the state grant oil and gas leases on 32,351 acres underlying Mobile Bay.

The department received high bids totaling $105,217.10, or an average of about $3.25 an acre, for the underwater leases. In all, the state offered leases February 3 on about 345,000 acres in Mobile Bay, Mississippi Sound, and the Gulf of Mexico, and about 14,200 acres under other state waters *(The Oil and Gas Journal, January 30, page 133)*.

All bids were tentatively rejected last week except seven for tracts in Mobile Bay and one for a Clarke County block. Stanolind Oil & Gas Co. was high bidder for six Mobile Bay blocks.

A spokesman for the conservation department said bids may be invited in about 2 weeks on leases covering additional tracts in the gulf, Mobile Bay, and Mississippi Sound. He said deadline for submitting bids probably will be delayed about 5 months to permit adequate time for geophysical work by interested companies.

Only odd-numbered tracts in the gulf and bay areas were offered in the recent sale. Plans call for putting the even-numbered tracts on the block in the next auction.

Apparently successful bids from this month's sale were disclosed last week after the conservation department made its recommendations to Gov. James E. Folsom. The governor was expected to give formal approval to these leases within a few days:

. . . **Tract 23, Mobile Bay,** 5,165 acres, Gulf Refining Co., $15,587.

. . . **Tract 25, Mobile Bay,** 2,155 acres, Stanolind Oil & Gas Co., $4,525.50.

. . . **Tract 19, Mobile Bay,** 5,165 acres, Stanolind, $27,116.25.

. . . **Tract 17, Mobile Bay,** 5,115 acres, Stanolind, $10,741.50.

. . . **Tract 15, Mobile Bay,** 4,421 acres, Stanolind, $9,284.10.

. . . **Tract 13, Mobile Bay,** 5,165 acres, $27,116.25.

. . . **Tract 9, Mobile Bay,** 5,165 acres, Stanolind, $10,846.50.

. . . **Sections 21, 22, and 27,** Township 7 North, Range 1 East, Clarke County, 1,917.6 acres, Sun Oil Co., $9,600.

# Tax Bills Killed

## Favored severance-tax plan loses out in Colorado vote

DENVER.—Colorado lawmakers have killed proposed constitutional amendments calling for an oil and gas severance tax with a 5 per cent limit.

Severance-tax measures in both houses sought to replace the present oil and gas gross income tax which yields about $4,000,000 annually. This levy is being challenged in the courts as unconstitutional and discriminatory by The California Co., largest producer in Rangely field.

The minority Democrats claimed the proposals were a "sell out" to the oil industry. They refused to vote for any severance-tax proposal which limited the amount of tax which could be collected. The Republicans stood firm behind a 5 per cent ceiling but were unable to muster a two-thirds majority in either house. This was required to get a proposed constitutional amendment on the November election ballot.

The industry lobbied for passage of the proposals because either would have allowed oil companies to deduct all ad valorem taxes paid to counties on oil and gas production. This is not possible under the gross-income levy. This deduction would have been made from the 5 per cent tax before payment was made to the state.

## Refinery Units on Stream

CHEYENNE, Wyo. — Frontier Refining Co. has started up new Platforming and Unifining units at its 10,000-bbl. Cheyenne refinery. Both are electronically controlled.

This marks the first completely electronic transmission of liquid-level indications to the graphic panel for any U. S. refinery.

The 2,000-bbl. per day Platformer is charging 180° to 400° F. Wyoming naphtha for upgrading to high-octane blending stocks.

The Unifining unit will operate alternately between high-sulfur straight-run distillate and a mixture of distillate and catalytically cracked cycle oil. Capacity is for 3,000 bbl. per day of straight 375°-560° F. distillate and 2,500 bbl. per day of the 500°-650° F. mixed feed. The unit will produce kerosine, light furnace oils, and diesel fuel.

Complete elctronic instrumentation was chosen because the severe Cheyenne winters frequently cause pneumatically controlled instruments to freeze. Units and electronic instruments were designed by Universal Oil Products Co. and built by Procon, Inc.

# Drilling Costs Reduced

## New cyclone drilling-mud classifier saves money through reduced drilling time, fewer bits used, longer pump life

OKLAHOMA CITY. — A cyclone drilling-mud classifier is likely to be the next standard piece of equipment on the drilling rig. And its importance will rival that of the shale shaker.

While the shale shaker uses a vibrating screen to separate shale or other undesirable heavy particles from drilling mud, the cyclone operates on the centrifuge principle.

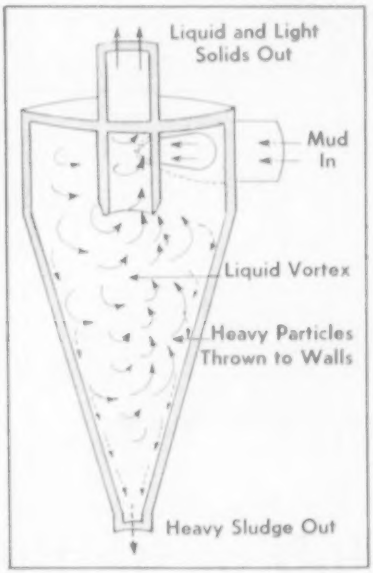
Here are some of the benefits realized from cyclones on 9,000-ft. wells drilled on the Gulf Coast:

**. . . Drilling time reduction** of 3 to 4 days.

**. . . Saving of several bits** on each well.

**. . . Increased life for pump parts** of 300 to 400 per cent.

From these advantages it's easy to see that the new mud classifier offers the prospect of substantial dollar savings on each well.




**Status of cyclones . . .** The liquid cyclone was discussed at the quarterly meeting of the A.P.I. Mid-Continent Committee on drilling fluids. Reports on results obtained on the Gulf Coast were made by R. L. O'Shields, of Salt Water Control, Fort Worth, Tex.

Cyclones used in the field so far have operated primarily on unweighted drilling mud. Their primary function has been to remove sand and to minimize mud weight buildup from drilled solids.

W. E. Bergman, Phillips Petroleum Co., Bartlesville, pointed out, however, that the cyclones can also be used on weighted muds to recover barite and minimize dilution. Phillips' work on this phase looks quite promising and field tests are being made.

**How they work . . .** Liquid cyclones separate heavy solids from liquids on the same principle as the centrifuge that has been used lately to recover barite from drilling muds.

Liquid mud, pumped into the device tangentially, whirls around a central vortex like a cyclone. This rapid whirling motion causes high centrifuge acceleration. The heavy particles are thrown outward to the walls. They drop down the walls and discharge in a heavy sludge through the apex. Liquid and light particles follow the central vortex upward to a discharge tube.

The force produced by present liquid cyclones is something like 2,000 times that of gravity. A similar force is exerted by the decanting-type centrifuge.

**What's ahead . . .** Cyclones have been used primarily to remove sand from light muds and barite from heavy muds. But it appears that a unit may be designed to do both.

In the upper part of the hole where mud weight is low, it would remove sand. Then, when the mud is weighted up, the unit would recover barite and minimize dilution.

Another possibility involves use of two cyclones in series. One would remove sand and the other would remove and recover barite.

**Dollar savings promised . . .** Savings of perhaps $3,000 per well could be realized by use of the cyclone to remove sand from mud weighing under 10 lb. per gallon.

Another $1,000 might be saved by recovering barite from muds up to 12.5 lb. per gallon, according to facts outlined by H. A. Bourne of Continental Oil Co., Ponca City, who discussed the decanting centrifuge. If mud weight were increased up to 15 lb. per gallon, in areas where bentonite shales are drilled, the cyclone might save an additional $6,000.

Cost of the cyclone is relatively small. One unit, designed to process over 10 bbl. per minute, costs about $5,000.

# Oil Claims Attacked

## ● U.P. sold its oil rights along with lands, court suit in Colorado declares

STERLING, Colo. — Union Pacific Railroad's claim to oil and gas rights on former land grant areas along its right-of-way is being challenged in district court here with millions of dollars at stake.

Plaintiffs are two Logan County landowners, Sara M. Radke and Edward F. Karr. They are contesting the railroad's claim to oil rights on 160 acres of farmland northeast of Crook, Colo. The hearing opened Tuesday amid indications it would last more than a week.

The 160-acre tract is only one parcel of vast quantities of land in the West granted to the railroad by Congress in 1862. The land grant, in alternate odd-numbered sections, extended 20 miles on either side of the U. P. route. The railroad sold the land to finance its construction.

The case here centers on the railroad's wording of sale provisions when it disposed of the land. The U.P. reserved title to "coal and other minerals." The suit contends this does not include oil.

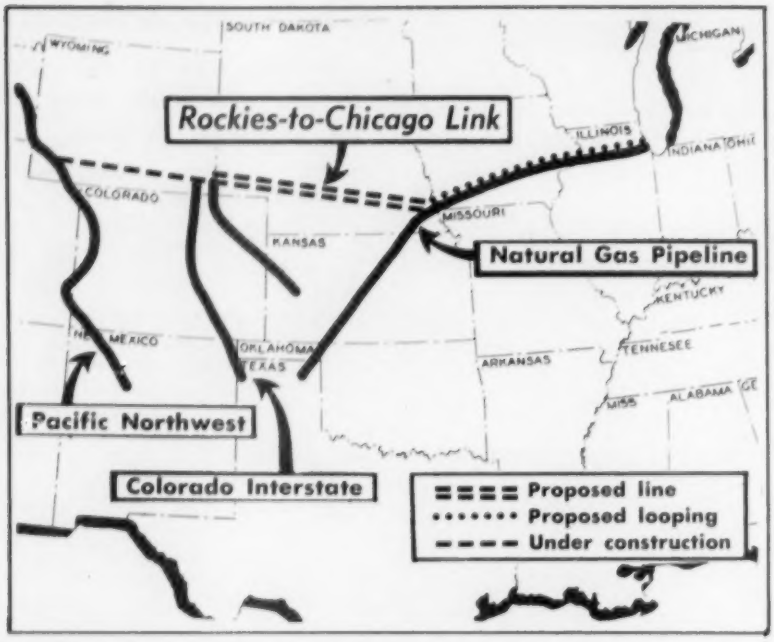
The suit resulted when the two landowners reportedly contracted with Platte Oil Co., Wichita, Kans., for drilling rights on the land. The Union Pacific contends the contract is illegal and sent two special cars of attorneys here in an effort to win the civil action.

**Much is involved . . .** P. C. Musgrove, president of Platte Oil, recently announced his firm had leased "several hundred thousand acres of such land" along U.P. right-of-way. He disputed the railroad's claim to oil underlying the land, and he threatened court action if the carrier tried to interfere.

Observers in the courtroom here said many oil companies would welcome a decision favorable to the landowners. They explained that the railroad has been insisting on a 15 per cent royalty in development transactions. The U. P. keeps the customary 12½ per cent royalty and gives 2½ per cent to the landowners as "a goodwill gesture."

If the U. P. claim is upset, oil firms probably would be able to acquire more leases at 12½ per cent if they dealt with the individual landowners.

The U.P. and federal Government also are involved in an appeals court battle over who owns the oil rights on the road's right-of-way in Wyoming. The railroad won a lower court decision, but the Government appealed.




## *Canadian vs. U.S. Gas . . .*

# . . . Chicago Hub of Battle

WASHINGTON. — Chicago natural-gas interests are making a bold move to step up their service in the midwestern marketing area, now threatened with invasion by Canadian gas.

Peoples Gas, Light & Coke Co. is spearheading the action. It involves two pipeline projects costing $148 million to bring natural gas from the American Rockies to Chicago.

The general Chicago area already is served with gas from the Texas Pandle and the Texas-Louisiana gulf coast. But an estimated 200,000 customers wanting gas service are on utility waiting lists.

With an eye to this potential market, Midwestern Gas Transmission Co., an affiliate of Tennessee Gas Transmission Co., is asking the Federal Power Commission for authority to cut across this region. It proposes a $98-million pipeline from Emerson, Man., to Portland, Tenn. The line would link the proposed Trans-Canada Pipeline with T.G.T.'s present mainline system *(The Oil and Gas Journal, October 17, 1955, page 90)*.

The entry of Canadian gas into the market is opposed by interests already serving the area plus coal, rail, and labor groups. Peoples' move last week thus was viewed as an effort to increase the gas service for the midwest, eliminate the embarrassing waiting lists, and remove one of the arguments for Midwestern moving in.

**What's involved . . .** Peoples moved through a subsidiary, Natural Gas Pipeline Co., and made a deal with Colorado Interstate Gas Co. The proposal presented to the FPC involves:

**. . . Natural Gas** will spend $80 million expanding a section of its Texas-to-Chicago line from Joliet, Ill., to Beatrice, Neb.

**. . . Colorado Interstate** will spend $68 million on a line from near Laramie, Wyo., to Beatrice to link its system with Natural Gas. Colorado Interstate already has started work on a line approved by the FPC linking its system with Pacific Northwest Pipeline Corp. This will make San Juan basin and Rocky Mountain gas available to it.

The project would add 435 million cubic feet a day to Natural Gas' pipeline delivery capacity. This is an increase of 40 per cent over its present capacity of 522 million cubic feet.

This will be a big boost for Peoples, which distributes in the Chicago area. It now has a total of 1,041 million cubic feet of capacity, including 519 million from another subsidiary, Texas Illinois Natural Gas Pipeline Co. This total will be boosted to 1,476 million exclusive of the extra "lift" available on peak days from underground storage facilities at Herscher, Ill.

**How it works . . .** Most of the new gas will be supplied the Peoples system by Colorado Interstate.

The Colorado firm will move up to 350 million cubic feet of gas a day over the proposed 500-mile line to Nebraska. Colorado Interstate already has agreed to buy up to 100 million cubic feet from Pacific Northwest and move it over a 400-mile line now being built across southern Wyoming.

The other 85 million cubic feet daily additional will be drawn from present sources of Natural Gas in the Texas, Kansas, and Oklahoma fields.

To take care of this extra load, Natural Gas asked the FPC for authority to undertake a 3-point expansion. It includes:

**. . . Lay 389 miles of 36-in.** line in the first 476 miles west of its Joliet terminal. This will loop most but not all the route of the two existing transmission mains.

**. . . Lay 91 miles of 30-in.** loops over various segments of the remaining 415 miles of the line.

**. . . Step up the system's compressor** station power from 151,500 to 194,500 hp. This would be accomplished by modifying 86 gas engine-driven compressor units at nine of the company's 12 compressor stations and installing two new 3,000-hp. centrifugal gas turbine compressors at the Colorado Interstate-Natural Gas junction.

Natural Gas says if FPC authorization is given quickly it can complete the expansion by the summer of 1957 and place the new installations in operation as early as December 1957.

**Waiting customers . . .** The reason behind the Peoples expansion is a big waiting list of customers wanting service.

James F. Oates, Jr., chairman of the Peoples system estimated that Peoples Gas has about 92,000 on its waiting list wanting natural gas for home heating. He said the waiting list in the entire Chicago area served by Peoples pipeline subsidiaries probably totaled 200,000 persons.

Oates declared the extra gas probably would eliminate the waiting list.

He admitted that he and other Peoples' officers are concerned by the attempt of Midwestern Gas to build a line and sell gas to several large steel firms and possibly others in the Chicago area. He added his group was opposing the move as "not being in the best interests of the public."

Oates pointed out the proposed projects would give the Chicago area three sources of supply: The Rockies, the Hugoton area of Texas, Oklahoma, and Kansas, and the Gulf Coast.

But final say in the competition for the Chicago area market will come from the FPC which currently is holding hearings on the Midwestern Gas application.

*Royalty interests unanimous . . .*

# . . . Units Unitized at Coy City

KARNES CITY, Tex.—They don't come any more thoroughly unitized than small Coy City field on the Texas Gulf Coast.

Coy City is a gas-distillate field in Karnes County on the Wilcox trend. It has four separate reservoirs in the Wilcox section between 6,900 and 7,800 ft.—the "A," "B," "C," and "D" zones. Two of these, the "A" and "D" horizons, have accounted for essentially all the field output so far.

The field was discovered by Seaboard Oil Co. in 1945. It has been completely defined by dry holes and fully developed with six producers.

Each producing zone was unitized separately during the years since the discovery.

Now the operators have "unitized the units."

**How output is split . . .** The Texas Railroad Commission has approved a request by Seaboard and Pan American Production Co. that field operators be allowed to put production from all zones into a single pot.

They will split it up by a participation formula based 100 per cent on acre-feet of pay.

Simplicity of the participation formula, at a time when such formulas seem to be getting more and more complex, is unusual in itself.

Field operators feel that by unitizing the entire field, they can better control production and increase ultimate recovery from Coy City.

There are three operators (F. Klingeman is the third) and 50 royalty owners in the 1,540-acre unit. Both working and royalty interests favored the move 100 per cent.

All field rules will remain the same, except that the former allocation formula will be suspended as long as the field operates on a completely unitized basis.

**Field geology . . .** Like many other Wilcox fields, Coy City geologically is a simple closure on the downthrown side of the down-to-the-coast fault.

Its four producing zones vary considerably in size.

The "D" zone is the biggest with 1,027 acres, a pay thickness averaging 23.9 ft., and total production of more than 12 billion cubic feet of gas and 637,000 bbl. of condensate.

The "A" zone underlies 907 acres, averages 14.2 ft. thick, and has produced 2.1 billion cubic feet of gas and 56,800 bbl. of condensate.

The "B" and "C" pays—acreages of 760 and 370 acres and average pay thicknesses of 16.2 and 6.9 ft., respectively—have not been produced.

Gas production is sold to United Gas Pipe Line Co.

# Petrochem Spending to Climb

PHILADELPHIA.—Plant investment in the petrochemical industry will double by 1960 when it will total $8 billion.

That's the forecast of Henry G. McGrath, associate manager of the business development department of M. W. Kellogg Co. He outlined prospects of the industry in addressing the first Delaware Valley regional meeting here of the American Chemical Society.

McGrath estimated that petrochemical production in 1956 will reach nearly 35 billion pounds compared with total chemical output of 127 billion pounds. Not only is the volume of petrochemical output growing but also the line is spreading. Nearly 3,000 chemical substances now are made from natural gas and petroleum and new products are being added at the rate of about 400 per year.

In the long range future, McGrath said that the 1960 petrochemical ouput should reach 60 billion pounds representing 33 per cent of all chemicals. He foresaw an output by 1965 of 125 billion pounds or 50 per cent of all chemicals.

The dollar value, according to McGrath's estimates, should rise from $5.7 billion in 1960 to $9 billion in 1956. That should account for 60 per cent of total chemical sales. The 1954 petrochemical sales amounted to $4 billion compared to $5.2 billion for finished rubber goods and $11.6 billion for petroleum products.

McGrath reported petrochemical's grow rate from 1929 to 1954 has been phenomenal. It has averaged 10.8 per cent per year contrasted with 7.8 for natural gas, 4.5 for petroleum, and 4.5 for all industries.

# Alberta Play Opens

## Oil finders look north in wake of Union's discovery

CALGARY.—Union Oil Co.'s new discovery, considered the most important in Alberta since Pembina, has centered new exploratory interest on the northern part of the province.

The fresh excitement was sparked by the Union 12-17 Red Earth some 70 miles north of Lesser Slave Lake *(The Oil and Gas Journal, February 13, page 87)*.

When it was disclosed that Union tests recovered 4,000 ft. of crude oil, opening up a thick new pay zone, oil companies hurried to snap up any remaining acreage available.

Land department officials estimate that the past week has seen reservation rights taken out on nearly 5,000,000 acres. Ninety per cent of the major companies operating in the province have applied for oil and gas reservation tracts in this vast new area 220 miles north of Edmonton.

**Why the excitement . . .** The Union discovery will result in exploration of a region that has largely been ignored up to now.

Interest is high because:

**. . . The Red Earth area** is one of the few in Alberta where large sections of reservation acreage are available.

**. . . The wildcat opens up** more new prospects than any find in several years.

**. . . Pay zone fairly shallow** (4,700 ft.).

**. . . It's in an accumulation** of granite wash.

The new pay stretches across northern Alberta from a point 80 miles east of the British Columbia border to Saskatchewan. Prime attention is around Lesser Slave Lake. Most of the territory immediately surrounding the Union strike was already tied up. Union has a block of 700,000 acres there.

## Texaco Has Utah Find

DENVER.—The Texas Co. has completed a good discovery in San Juan County, southeastern Utah, in the Paradox basin.

The 1 C Navajo, located 10½ miles northeast of Desert Creek field, flowed 430 bbl. of oil in an 8-hour test through open 2-in. tubing. Perforations were at 5,828-74 ft. in the basal Hermosa. Total depth was 5,923 ft.

Texaco has staked location for a second test in the area, the 1 D Navajo. Superior Oil Co. also plans a well in the vicinity, the 1 A Navajo.

**INVESTIGATION by the Texas Railroad Commission into fields exempt from shutdown days attracted a crowd of oil men. Shown left to right are Commission Examiner M. L. Coker, M. L. Gilbreath of Houston, representing McCarthy Oil & Gas Co.; Tom Malloy of Houston and C. G. Condra of Fort Worth, both representing Stanolind Oil & Gas Co.**

# Water-Flood Fight Brews

## Texas producers victorious in initial clash on limiting their operations, now girding for showdown with Humble

DALLAS.—Texas oil producers, spearheaded by West Central and Permian basin groups, are waging a continuing battle to keep their production from water-flood projects free of restrictions.

The water-flood producers won their initial clash before the Texas Railroad Commission. But they feel the fight is not over and apparently their strategy for the moment follows this line:

**. . . Send representatives** to hearings of the commission being held to study all fields exempt from shutdown days.

**. . . Gather all statistics** possible as ammunition to prove finally that unrestricted production is vital to efficient flood performance and recovery of the most oil.

**The issues . . .** Humble Oil & Refining Co. is the object of the producers' attention.

Humble on several occasions late in 1955 urged new rules on the Texas Railroad Commission. It wants to hold new water floods to yardstick allowables, pare allowables higher than yardstick down to these figures at already-approved projects, and cancel exemptions of all such projects from shutdown days *(The Oil and Gas Journal, December 19, page 50)*.

Humble's point was that secondary water-flood production is increasing so fast under current regulations that primary proratable fields in the state are being unduly penalized.

This shouldn't be, the company maintains, because Humble studies have shown that water-injection rates in floods can be controlled to limit oil production without damaging the flood mechanism or causing waste.

Actively pushing these contentions, Humble objected to higher allowables for water floods whenever hearings were called on applications at Austin late last year. In each case, the commission approved the application anyway.

Considerable opposition to Humble's stand has developed from producers with floods and from producer organizations in some Texas water-flood areas.

These include the West Central Texas Oil and Gas Association, the West Central Texas Water Flood Association, the Permian Basin Water Flood Association, and a large group of oil companies — mostly independents but several majors.

**The case for floods . . .** Spokesmen for this side say that by far the bulk of technical findings hold that high and continuous rates of water injection and oil production are necessary for maximum ultimate recovery in a water flood.

They argue further that most water floods are fairly small projects carried out by independents. Such operators aren't in any position financially to invest large sums in a water flood and then wait years to get their money back much less to make a profit.

This essentially is what the situation would be if Humble's suggested regulations were adopted, they say. A result would be that a great number of likely projects never would be started and thus a great quantity of recoverable oil lost.

The water floods at issue are true secondary projects where primary production is depleted. Those fields in which floods are launched earlier in the field life as pressure-maintenance projects are prorated just as are other primary fields.

**Flooders worried . . .** Despite their initial victories, many producers with water-flood production are apprehensive.

One big reason for this is that the Texas Railroad Commission not long ago announced that it was beginning a systematic review of every field in Texas which is now exempt from shutdown days.

It said it was interested in finding out:

**. . . The conditions** that exist upon which it granted the field's current exemption.

**. . . The history** of the field since that time.

**. . . If conditions still exist** to warrant continued exemption.

Water-flooders feared that this commission action was a direct result of Humble's attack on unlimited water-flood production and that water floods were the object. Water-floods aren't the only exempt fields in Texas, of course. Others are exempt because of heavy water production or because they are marginal operations for other reasons.

The commission's failure to mention water floods in the notice and its refusal to be pinned down on just what it intended to do, however, added to the apprehension.

Consequently, a crowd of operators showed up in Austin February 1 when hearings on the first of the exempt fields were held. Humble was unusually well represented and so were the water-flood operators.

First exempt hearings deal only with fields in District 3 on the Gulf Coast where there are few water floods. Other districts where water floods are numerous will be taken up later.

**The attack . . .** The water flooders took the offensive quickly.

During the hearing on Arriola field, Ira Butler, Fort Worth, led off with a request that the commission, as a result of the Gulf Coast hearings, "not adopt a general policy which would affect West Texas fields."

There are a number of water floods in West Texas now and more are under study, he said. "Unless made economically infeasbile by a change in the commission's policy," more will be undertaken.

"By such projects vast quantities of oil which will be needed during the ensuing years — and which otherwise will not be recovered—will be produced. Millions of dollars must be spent in putting such projects into operation. We urge the commission not to depart from the policy, which it has followed in the past, of encouraging such projects. We believe the commission should give proper recognition to the MER of a reservoir resulting from pressure maintenance and continue the exemption of water floods."

Other operators and association representatives joined Butler to ask that the commission:

. . . **Retain its present** policy on exempt fields, or

. . . **Withhold any new general policy** until all exempt fields in the state had been covered.

Those formally stating such a position were: West Central Texas Oil and Gas and Waterflood associations, the Permian Basin Water Flood Association, Gulf Oil Corp., The Texas Co., Ambassador Oil Corp., Forest Oil Corp., Richardson & Bass, C. T. McLaughlin, Neville G. Penrose, Inc., E. L. Anders, Jr., James E. Russell, Eastland Oil Co., W. P. Luce, and C. O. Ice.

The hearings on 10 exempt Gulf Coast fields which followed were routine. Operators in all 10 uniformly asked for continued shutdown exemption. The commission will rule on these after reviewing the evidence.

Other District 3 exempt fields along with those of other districts will be taken up at the day-a-week series of hearings which likely will last most of the year.

Humble representatives, though present, did not make a statement.

**Gathering ammunition . . .** Though a showdown was averted at the initial review of exempt fields, producers are preparing for battle just in case.

Early this month, a letter and a questionnaire was sent to 500 Texas water-flood operators and engineers by the combined water-flood committee of the West Central Oil and Gas and the West Central Texas and Permian Basin Water Flood associations.

The letter summed up developments in the controversy to date, summarized finds of the joint committee, and asked for further information on:

. . . **Effect of injection rate** and pressure on ultimate recovery.

. . . **Effect of varying rates** and pressures on flood performance.

. . . **Effect of shut down** of injection or producing wells or both.

. . . **Characteristics** of capacity pumping and flowing floods.

The committee advised the operators that it wanted all information possible on these four problems. A brief will be prepared by the time another operator should request an increase in allowable for a water-flood project.

"Any information you can furnish us, either field data, laboratory data, personal observation, or opinions with regard to this problem will be greatly appreciated and we feel very important to the continued efficient operations of water flooding in Texas," the letter said.

All these preparations indicate that the last word on water-flood allowables in Texas has not yet been spoken.

# New Partners in Trans-Canada

## Canadian Gulf, Hudsons Bay pay $8½ millions for 17 per cent interest in move to help finance pipeline project

CALGARY.—Two of western Canada's largest oil and gas producing companies have bought interests in Trans-Canada Pipeline Co., Ltd., in a reported $8.5 million deal.

The transaction was made by Trans-Canada management in an effort to complete financial arrangements for building the cross-country pipeline by the May 1 deadline.

New partners in the venture are Canadian Gulf Oil Co., a subsidiary of Gulf Oil Corp., and Hudsons Bay Oil & Gas Co., Ltd., an affiliate of Continental Oil Co. Original sponsors of the project are Canadian Delhi Oil, Ltd., the Western Pipelines Group, and Tennessee Gas Transmission Co.

The new division of ownership gives each of the new partners along with T.G.T. 17 per cent and Canadian Delhi and Western each 24½ per cent. Earlier owners reduced their stock positions to permit participation of the new companies.

N. E. Tanner, Trans-Canada president, said the percentage positions of all companies in the venture apply only until the time of public financing. At that time not less than 51 per cent of all common shares outstanding will be made available to the public.

Meanwhile, the big question here is whether the Canadian Government will extend the May 1 deadline for completing financial arrangements. The delay in a ruling from the U. S. Federal Power Commission on T.G.T.'s application to import Canadian gas into the U. S. through its affiliate, Midwestern Gas Transmission Co., has dimmed enthusiasm of public officials.

Statements from the Canadian cabinet indicate definite opposition to extending the financing time unless Trans-Canada can guarantee that construction of the Alberta-Winnipeg section can be started this year.

Trans-Canada officials, however, are confident that the renewed interest and financial backing resulting from last week's deal will smooth the way for the extension.

# New Form Approved

## Standard drilling report endorsed by A.P.I. group

DALLAS.—The General Committee of the American Petroleum Institute's Division of Production has approved the standardized daily drilling report form brought out by the American Association of Oilwell Drilling Contractors early in 1954.

This means the form henceforth will carry the A.P.I. monogram or stamp of approval. Distribution of the form will continue to be from the A.A.O.D.C. head offices at Dallas.

The form, though basically the same, has been revised slightly since first published and distributed. It has been studied closely by both organizations for the past 3 years.

The new form will:

. . . **Save time** for the driller because he will have only one instead of two forms to fill out.

. . . **Eliminate conflicts** in accounting between the oil company and the contractor caused by errors made when filling out two different drilling reports.

. . . **Insure completeness and accuracy** because all drillers will become familiar with the one standardized form, regardless of the company or contractor for whom he is working. Previously each company and contractor used different forms depending on what it felt was desired information.

. . . **Provide adequate information** for a contractor to see better just what he is getting out of his rig.

# D-J Prices Posted

## Confusion reduced as majors post first field prices in the basin; for connected producers, it means a pay hike

FIELD prices for crude oil in the Denver-Julesburg basin have been posted for the first time by major buyers in the area, ending a confused pricing situation which had existed since the area began producing.

The postings increase wellhead prices to producers in fields connected with gathering systems, but do not change the competitive position of most Rocky Mountain crude relative to Mid-Continent crude.

The posted prices start at $2.83 per barrel for crude of 40° gravity and above and scale down to $2.41 for 20° and lower gravity. This compares with the Mid-Continent gravity scale with a $2.90 top, but because of differences in pipeline tariffs both crudes are delivered to Chicago at approximately $3.31 per barrel.

Identical schedules were posted February 1 by the four major buyers in the area: Stanolind Oil Purchasing Co., Sinclair Crude Oil Co., Pure Oil Co., and British-American Oil Producing Co.

The postings apply to all connected fields in Banner, Cheyenne, and Kimball counties in Nebraska, and in Adams, Logan, Morgan, Washington, and Weld counties in Colorado. This includes practically all the producing areas of the Denver-Julesburg basin.

Crude trucked from unconnected fields will be purchased at pipeline tender points at the $2.83 top scale. This means that producers in unconnected fields must absorb gathering and trucking charges, while producers connected with gathering pipeline systems will get the full scale at the lease tanks.

**The reason . . .** The major factor in bringing about the postings was the recent absorption of the Pawnee and Goodall pipelines into the Arapahoe system.

These short lines originally were separately owned and operated, but at various times major blocks of ownership were acquired by Sinclair and Pure, joint owners of Arapahoe. The lines run from Adena, Little Beaver, and other fields in the southern part of the basin northeast to Merino to feed into the Arapahoe trunk line to the east.

While separately operated as intrastate carriers, Goodall and Pawnee had tariffs of approximately 16½ cents to Merino, where buyers paid $2.93 per barrel for top-gravity crude—the standard price at tender points on all trunk lines serving the area.

Now all tender points on the Arapahoe system, including the old Pawnee and Goodall branches, have the same tariffs to the east. By posting prices of $2.83 and absorbing the gathering charge of 10 cents, buyers have kept prices the same to eastern refineries. However, producers on gathering systems now get an increased netback at the well of 6½ cents.

**Some lose . . .** On the other hand, producers with unconnected leases have their netback reduced by 10 cents per barrel (assuming no change in trucking costs) because they now receive only $2.83 at tender points instead of the former $2.93.

By the same token, eastern refineries can now purchase trucked crude at 10 cents per barrel cheaper than formerly. The chief beneficiaries of this situation are independent refineries, primarily in Michigan, who purchase Denver-Julesburg crude from independent crude jobbers and truckers in the area.

The lack of posted field prices and the existence of independent gathering systems and feeder lines had created much confusion and misunderstanding regarding actual prices of crude in the Denver-Julesburg basin *(see The Oil and Gas Journal, September 12, 1955, pages 88-90).*

The new postings and extensions of Arapahoe tariffs are a big step in bringing order to crude marketing in the Rocky Mountain region. There are still some gathering charges out of line with the general 10-cent rate, and still many fields unconnected to pipelines and therefore without posted prices as such. Also, for the most part, there are still no posted prices for the newer fields in eastern Wyoming and eastern Montana north of the Denver-Julesburg basin.

## Mississippi Has Gas Find

ABERDEEN, Miss.—Pure Oil Co. last week opened a new gas field in the northeastern Mississippi portion of the Black Warrior basin.

Its discovery well, 1 E. L. Murphree, is estimated good for 3,000,000 cu. ft. of gas daily by open flow from Carter sand (Mississippian-Chester) at 2,012-44 ft.

Location is in the northwestern corner of Monroe County, 3½ miles east of Okoloma, and 11 miles west of Amory, scene of Mississippi's first production (gas), now abandoned. It is 19 miles northwest of Shell Oil Co.'s Aberdeen gas field, nearest present production.

Pure's well, typical of others in northeastern Mississippi, encountered tight sand conditions, making commercial production difficult. It was drilled to 4,501 ft., in the Ordovician, and tested gas showings in several zones including the Devonian, before completing in the 2,000-ft. Chester-Carter sand.

# Feldman Expanding

## Independent bidding to be major producer in Canada

DALLAS.—D. D. Feldman Oil & Gas, Dallas, is launching a drive to become one of western Canada's big oil producers.

The company now has 22 producing wells in Saskatchewan. It plans to spend millions within the next 5 years to expand these operations by 1,000 per cent over western Canada.

The company will open temporary headquarters for the Canadian operation about March 1 in Calgary, and will move later into the Hudson Bay Oil & Gas Co. building now under construction.

Heading up the new office as manager of exploration will be R. G. Perry, who has resigned as exploration manager of Peel Plateau, Ltd. He directed an extensive geological program in the Yukon and Northwest Territories for that company.

Perry has served 8 of his 30 years in the oil industry in Canada. Before joining Peel Plateau, he was regional geologist for Phillips Petroleum Co. at Calgary, chief geologist in Canada for Sohio Petroleum Co., and a consultant at Calgary.

The Feldman Canadian division will engage in all phases of exploration and producing activity ranging from primary exploration through development drilling and acquisition of producing properties.

Harry W. Ross, Calgary petroleum consultant, helped plan the expansion and will be retained by Feldman as a consultant in the future.

Company production in Canada currently is in Cantuar, Gull Lake, Success, and South Success fields in Saskatchewan.

The Feldman concern in the last few years has been very active. Until 1955 its activities were confined to the United States. In the past year Feldman has entered Canada, Cuba, Europe, and the Middle East.

## Montana Sale Set

### Royalty tiff to be settled prior to March lease sale

HELENA, Mont.—The next auction of state oil and gas leases in Montana will be held March 19 at Helena.

The state Land Board already has 123 applications, and more are expected.

The board will decide before sale time whether some of the leases will be offered at the customary 12½ per cent royalty and others at 16⅔ per cent. The question of whether the board has authority to demand a royalty higher than that provided by law is pending before the Montana Supreme Court.

The royalty dispute was further complicated last week when the board refused requests for refunds on lands in an oil and gas lease sale last July.

Ohio Oil Co. sought to recover $34,240 it paid for three tracts in Fallon County and Continental Oil Co. asked return of $4,800 for a fourth tract in the same county. The leases called for 16⅔ per cent royalty but never were issued because of the Supreme Court litigation.

A Billings independent, C. M. Hall, was successful in obtaining a refund of $68,000 he bid for the same tracts at 12½ per cent royalty. His check was returned to Land Board Secretary Lou Bretzke, who later was ordered by the board to retrieve the check from Hall.

### Offshore Bids Run High

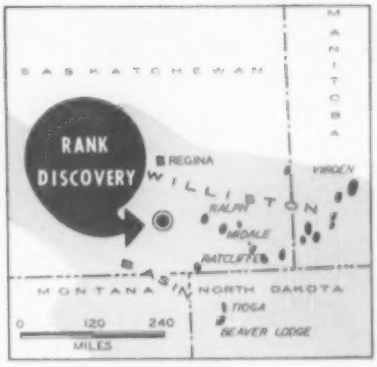
BATON ROUGE.—Magnolia Petroleum Co. submitted the top bid of $2,628,525 last week for an oil and gas lease on a 4,560-acre tract off the coast of Louisiana.

The prize acreage is in Block 17, West Cameron area, just off the southwest corner of Louisiana in the Gulf of Mexico. The block is a short distance south of Johnson's Bayou gas field onshore.

Last week's lease sale brought the Louisiana Mineral Board high bonuses totaling $7,066,075 for 26,610 acres.

Only two other offshore areas were offered for leasing. Both are small blocks off Cameron Parish.

Heaviest bidding was for acreage near the mouth of the Mississippi River in Plaquemines Parish. Three tracts in that area brought 17 bids, the highest being a joint offer of $1,636,361 by Cities Service Production Co. and Skelly Oil Co. for a 2,200-acre block in the Pass A Loutre area. The Texas Co. bid more than $1,000,000 for the same tract.




## Socony Test Hits

### Saskatchewan strike opens new pay in Williston basin

REGINA.—Mobil Oil Co. of Canada, Ltd., has opened up the first oil production in south central Saskatchewan 75 miles southeast of here.

The discovery is the North Roncott 34-9 located 28 miles north of the Montana border. It's the first Bakken (Mississippian) pay in the Williston basin. Nearest production is some 60 miles east at Ralph and about the same distance southeast at Ratcliffe.

Initial test recovered 200 ft. of mud-cut oil and 250 ft. of highly gas and oil-cut mud with no water from 5,971-89 ft. A later drill-stem test from 5,972-96 ft. recovered 470 ft. of clean oil of 41° A.P.I. gravity and 200 ft. of highly oil and gas-cut mud.

The crew carried the hole to 6,070 ft. and was logging before completion.

Success came after three previous wildcats within 5 miles of the North Roncott 34-9 failed to find commercial production. Mobil Oil Roncott 28-3 was abandoned at 6,720 ft., Socony-Sohio Roncott 11-10 at 6,340 ft., and Sohio-Standard Vicery 1 at 7,850 ft.

### Permian to Triple Plant

FORT STOCKTON. — Permian Basin Pipeline Co. has let construction contract for an expansion program which will triple capacity of its gas-treating plant in Puckett field of Pecos County, West Texas.

Processing capacity of the plant will be increased from the present 25,000,000 cu. ft. of gas daily to 80,000,000.

Contractor on the project will be Dresser Engineering Co., Tulsa. Work is scheduled to begin soon and will be completed in about 9 months.

Permian's Puckett plant, located at the extreme southern end of the pipeline system, extracts carbon dioxide from gas produced by a dozen wells operated by Phillips Petroleum Co.

## *Industry* BRIEFS

**SEATTLE. — Standard Oil Co. of** California has abandoned its wildcat near Sequin on Washington's Olympic Peninsula. This test, the 7,493-ft. Dungeness Unit, was the third unsuccessful wildcat drilled by Socal in the Pacific Northwest last year. The company drilled two dry holes in Oregon.

Two weeks ago, Sinclair Oil & Gas Co. abandoned Oregon's deepest wildcat, the 1 Federal-Mapleton in Lane County at 12,880 ft. These developments leave Oregon and Washington without a single well being drilled.

**VENTURA, Calif.—Tide Water As**sociated Oil Co. is about to get out of the drilling business. When two jobs are completed in the Ventura Avenue field, the rigs will be moved off. Then, for the first time since 1925, Tide Water will not have a company crew drilling in the field. At one time Tide Water operated 17 rigs there.

**LANSING, Mich. — Creation of a** state petroleum board to regulate the refining and oil wholesaling business has been proposed in the Michigan legislature by state Sen. Garland B. Lane, Flint Democrat. The board would be empowered to investigate business activities, practices and policies, and license firms. It would not control prices nor licence retail stations.

**NEWARK, N. J.—The New Jersey** legislature has been asked to regulate retail gasoline prices and give gasoline station owners, automotive mechanics, and gas station attendants professional recognition by licensing them.

Senate President Wayne Dumont, Jr., Warren County Republican, is sponsoring the bill. It would create a board to determine "average cost of doing business." This cost would be added to wholesale cost of gasoline and oil to determine retail price.

**BIG SPRING, Tex.—Badger Manu**facturing Corp. of Cambridge, Mass., has been awarded the contract to build a styrene-manufacturing unit at Cosden Petroleum Corp.'s 25,000-bbl. refinery here. Capacity will be 20,000,000 lb. of plastic-grade styrene monomer a year. Completion of the $3,000,000 unit is due by December.

**EAST CHICAGO, Ind. — Sinclair** Refining Co. will build a hydrofinishing unit, using catalytic-reformer hydrogen, at its 110,000-bbl. daily refinery here. Cost will be $1,300,000. Construction is to begin this spring. Completion is due late this year.

# Small Refiners Growing

● **Justice Department report shows quick tax write-offs have cut percentage of business held by "the Big 20"**

WASHINGTON. — The nation's refining base has been widened under the Government's tax amortization program. The grip of the 20 largest companies on plant capacity also has been loosened slightly.

Acting Atty. Gen. William P. Rogers has revealed these changes in the refining industry in a report just submitted to Congress. He outlined these developments of the emergency expansion program:

**. . . Smaller oil companies increased** their stature although big refiners participated in the largest tax writeoffs.

**. . . Tax avoidance** did not result from rapid amortization.

**. . . Momentum of expansion** is tapering off.

**. . . Revisions are now needed** to lighten the "anticompetitive" features of the plan in its future operations.

**WILLIAM P. ROGERS**
**. . . cites refining industry trends.**

**All benefit . . .** Increased concentration in the oil industry, feared by opponents of rapid amortization, has not developed, Rogers stressed.

The tax program was designed to get more refinery capacity for an emergency. It actually decreased rather than expanded the hold of the 20 largest companies.

Rogers reported the 20 companies in 1950 accounted for 83.7 per cent of crude runs to stills. But in 1954 their plants processed only 82 per cent. The share of all other companies increased during the 4-year period from 16.3 to 18 per cent.

Some 1,500 oil projects were approved up to the end of 1955. They called for total investment of $3,798,485,000, of which $1,988,421,000 was subject to accelerated amortization. The 20 major companies and their affiliates were granted quick write-off of $1,455,518,000 of an estimated $2,762,245,000 investment. All other applicants were granted $532,903,000 write off on $1,036,241,000.

**Tax results . . .** Rapid acceleration does not lead to tax avoidance, Rogers pointed out.

It merely provides a greater-than-normal deduction for depreciation, but for fewer years. Assuming profit and tax rates more or less constant, it delays but does not lessen ultimate tax liability.

The major companies, with adequate technical staffs and capital, logically could be expected to show greater readiness to take immediate advantage of the tax privilege. But the grant of certificates has favored the smaller companies somewhat "although the continued dominance by the 20 major companies indicates that the tendency has not yet produced substantial results," Rogers reported.

"In any event," he said, "contrary to fears expressed by some at the program's beginning, emergency amortization—at least in petroleum—has not increased concentration."

**Pace slacks off . . .** Although several expansion programs are still being pressed, the drive for additional capacity is losing momentum, Rogers' report showed. This is evidenced by the figures for the 5 years under review.

The expansion got off to a start in 1951 with the grant of quick write-off of $722,283,000 on new plant estimated to cost $1,057,322,000. In 1952 the program reached its top with $1,240,185,000 in new plant of which $530,917,000 was subject to rapid amortization. The total of new projects fell steadily thereafter, to $628,113,000 in 1953, $490,356,000 in 1954, and $382,509,000 in 1955. Last year accelerated amortization was allowed only $200,030,000.

There is a reason why the major companies received the larger share of tax amortization, Rogers emphasized. "Considering the emergency nature of the program and the overriding necessities of national security it is designed to serve, expansion of production is naturally sought from companies demonstrably capable of handling large-scale operations, regardless of the fact that they may be already dominant in production," he explained. "In many instances, in fact, there may be no practical alternative.

"Nevertheless, the need to preserve the free competitive basis of our industrial economy is also urgent. That need is served only if incentive grants of any type go primarily to the smaller companies, except where immediate defense necessity otherwise requires."

**Revisions . . .** Both voluntary agreements made under the Defense Production Act — on foreign petroleum supply and tankers—need revision.

Rogers said this is necessary to avoid "anticompetitive" possibilities.

A revision of the foreign petroleum supply agreement has been drafted and is under discussion with the Interior Department. Rogers did not say what form the revision will take. It already has been decided that the committee must be under a government official and not a director from the industry. The aim will be to "lighten the anticompetitive features of the agreement without detracting seriously from its potential contributions to the national defense," Rogers added.

The voluntary tanker plan was of great value from January 1951 to March 1953, but since has been dormant. But it should be kept alive in the event of a future emergency, Rogers said. On the other hand, in its present form, the agreement raises various antitrust problems.

"The problem in this case resolves itself into weighing of the contribution to the national defense of the potential and standby capacity of the participants against the exchange by the competitors of certain information as to the prices and capabilities of the industry," the report explained.

The problem is complicated by the fact that the agreement is "nonmilitary." If disapproved, Rogers declared, no similar agreement can be entered into under the Defense Production Act. Accordingly, it is planned to revise the plan. Two paragraphs will minimize the antitrust factors. One will provide that no further meetings of the tanker requirements committee can be held unless the Maritime Administrator finds that an emergency exists in the tanker field. The other will relate to the program for and minutes of meetings, merely formalizing practices which have been followed voluntarily by the committee.

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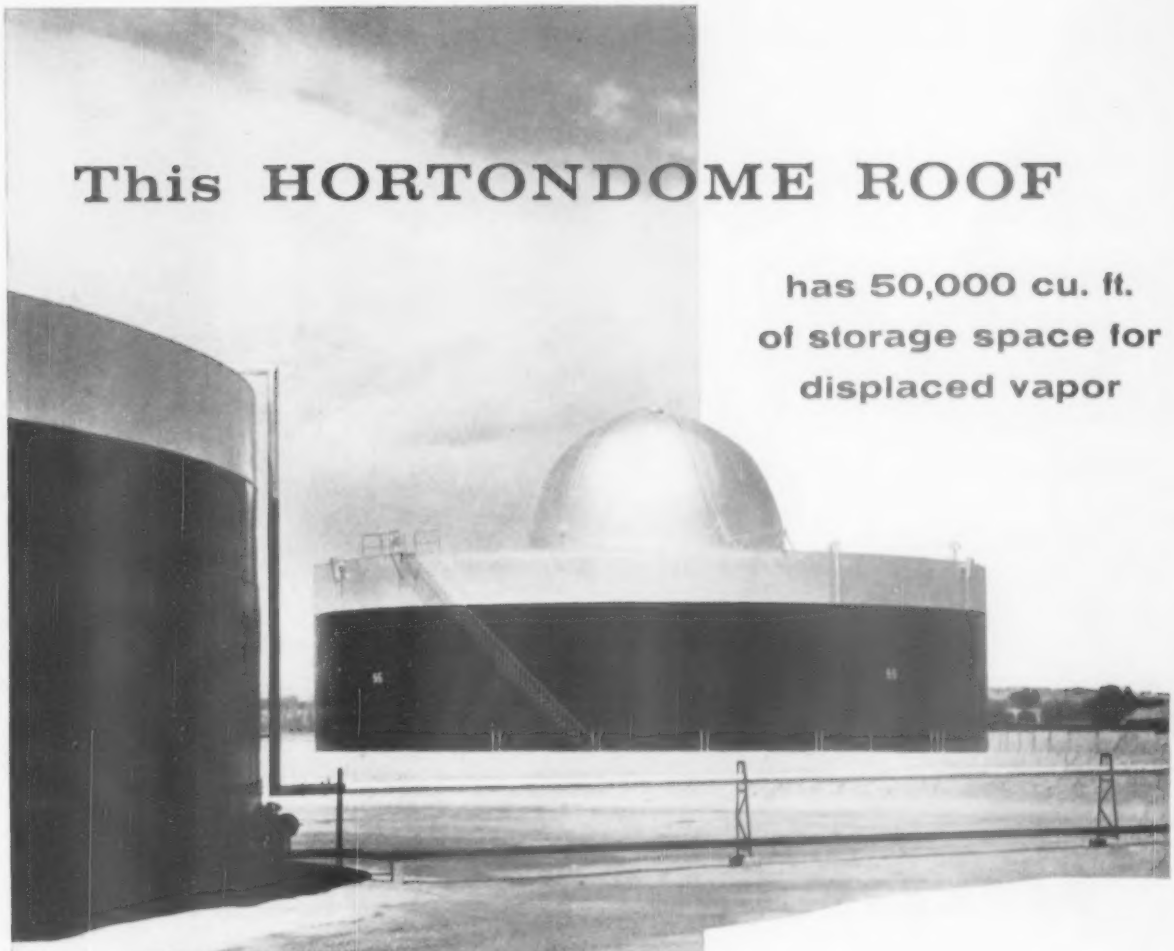

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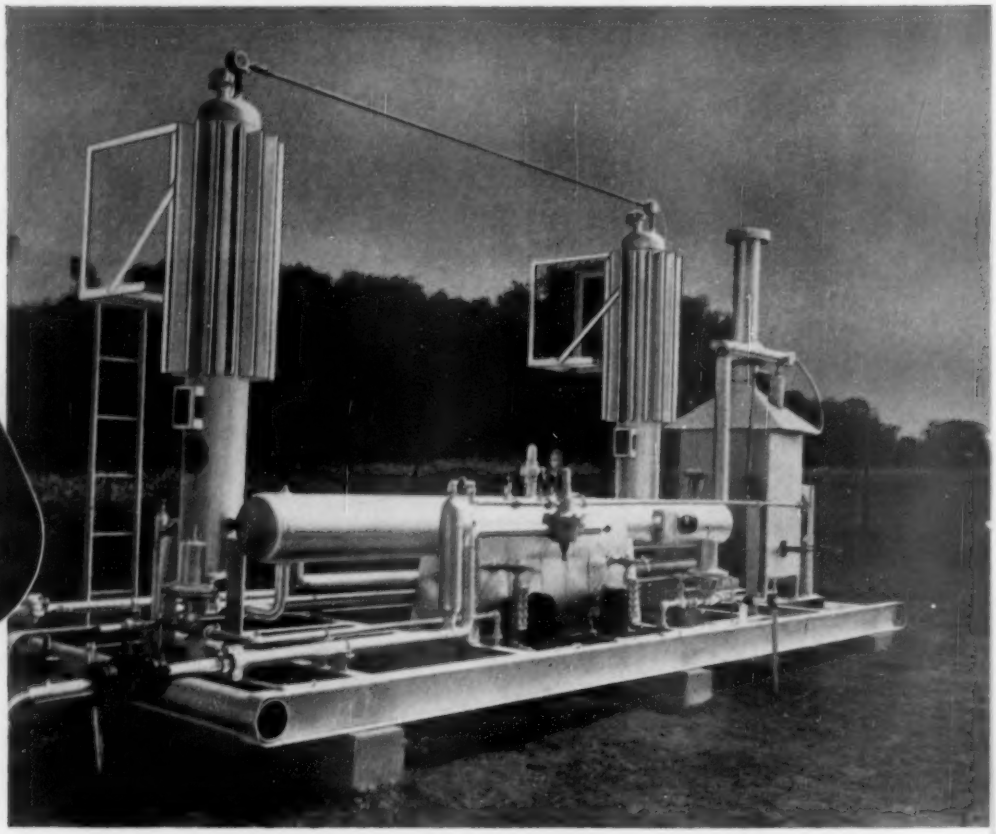

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## Texas Test Hits

### ● Flush production from Ellenburger assured in Upton County well

MIDLAND.—Texas Pacific Coal & Oil Co. is assured of a flush Ellenburger discovery at its 1 Jacobs Livestock Co. in southwestern Upton County of West Texas.

Heavy oil production was gaged on a drill-stem test at 10,545-10,641 ft. Oil surfaced in 1 hour and 45 minutes, then flowed 45 bbl. the first hour and 41 bbl. the second hour. Choke size was not reported.

Flowing pressure on tubing was 600-3,125 psi., with 15-minute shut-in pressure reaching 4,500 psi. Operators prepared to drill ahead from total depth of 10,641 ft. Gravity of the oil was 50° and gas-oil ratio was 489:1.

The Texas Pacific well is particularly significant because of the big Ellenburger structure at nearby King Mountain field. Drilling at King Mountain has been relatively slow, but the field is considered by many as West Texas' most important development of 1955. The Texas Pacific well is 3½ miles west of King Mountain field.

**Thick section indicated . . .** Texas Pacific drilled into the Ellenburger at 10,470 ft., or minus 7,534 ft. Humble Oil & Refining Co.'s King Mountain discovery went into the Ellenburger at minus 8,458 ft., and flowed over 1,600 bbl. of oil a day from 65 ft. of perforations.

First Ellenburger test in 1 Jacobs from 10,475-10,545 ft. recovered drilling mud with no pressures and no shows. The second test, which flowed 127 bbl. in 3 hours, covered a 96-ft. section. There was no water in the recovery from drill pipe.

**Tops and other shows . . .** On elevation of 2,936 ft., formation markers reported were: Yates 2,160 ft., Grayburg 2,895 ft., Devonian 8,533 ft., Silurian 9,469 ft., Fusselman 9,480 ft., and the Simpson at 9,610 ft.

A test in the Devonian indicated possible production from that formation. At 8,550-8,625 ft., the well made a flow of gas and recovered 350 ft. of heavily oil and gas-cut mud.

The upper Fusselman between 9,433-9,502 ft. developed 390 ft. of gas and oil-cut mud, with oil content running nearly 50 per cent. A test at 9,491-9,569 ft., also Fusselman, returned 140 ft. of slightly oil and gas-cut mud.

Tests from 9,603-9,700 ft., in either Wolfcamp or upper Pennsylvanian, recovered 3,000 ft. of gas and 330 ft. of slightly oil and gas-cut mud.

Texas Pacific holds several hundred acres around the new well. Others with leases are Wilshire Oil Co., Lone Star Producing Co., and Skelly Oil Co.

## New Lube Plant Set

### It will be the first such plant for U. S. in 5 years

CASPER, Wyo.—The first new lubricating-oil plant to be built in the U. S. in 5 years is being planned by Standard Oil Co. (Ind.) for the 21,000-bbl. per day refinery located here.

New facilities including four modern units for distillation and extractive separation, will boost present lube capacity of the plant from 650 to 1,030 bbl. per day of finished product.

Foster Wheeler Corp. of New York has been named general contractor for construction of a 4,800-bbl. per day vacuum pipe still, a 1,000-bbl. propane deasphalting unit, a 1,500-bbl. furfural extraction plant, and a 2,000-bbl. dual-purpose Methylethyl ketone unit which will perform both dewaxing and de-oiling.

Completion is scheduled for May 1957, according to Dr. C. C. Buchler, refinery manager. As soon as weather permits, refinery personnel will begin clearing sites for the first three units for construction to start in May. A separate site for the M.E.K. unit will be prepared later for construction in September.

The new program will permit the Casper refinery to meet the higher-quality requirements needed by future automobile engines. The new units will largely replace present facilities including vacuum distillation and Chlorex solvent extraction.

The Casper program represents the first across-the-board construction of a modern lubricating-oil plant since Standard Oil Co. (Ohio) built its new lube plant at Lima, Ohio, in 1950. Since 1949, total capacity for finished lubricating-oil manufacture in this country has risen only 3.7 per cent. The national figure has remained almost static at around 182,500 bbl. per day for the past 3 years.

Loss of capacity through shutting down outmoded "conventional" facilities has been roughly offset by new capacity in modern extractive facilities, mainly in the larger refineries.

## Public Favors Oil

### Industry's popularity is on rise, survey reveals

NATIONAL public opinion continues favorable to the oil industry and has improved since 1953. But there still is considerable number of people who hold the industry in an unfavorable light or have no opinions at all.

These facts about the oil industry turned up in a recent survey made by Opinion Research Corp., Princeton, N. J., and sponsored by the Oil Industry Information Committee.

The survey shows 75 per cent of Americans hold a favorable general impression of the industry; 9 per cent are unfavorable; and 16 per cent hold no opinion. In 1946, only 69 per cent "favorable" reaction was reported.

Minority criticisms picked up about the industry are that it is not fully competitive, is controlled by a few companies, and charges prices that are too high. There are no majority criticisms, however. Also there is much public concern for welfare of the service-station dealer but 6 out of 10 persons disapprove state control of retail gasoline prices.

The public is somewhat more favorably inclined toward the oil industry than toward the business system as a whole. Some 22 per cent think the oil industry needs little change while only 14 per cent feel the same way about business in general. Also, fewer people attribute bad features to the oil industry than they do to the business system.

## New Crude Route Sought

CHEYENNE, Wyo.—A Denver firm and two from Billings, Mont., have asked Wyoming's Public Service Commission for authority to build a 6-in., 34-mile pipeline from Murphy Dome in Hot Springs County to Ohio Oil Co.'s Bonanza pump station in Big Horn County.

Applicants are Shannon Oil Co., Denver, and Mule Creek Oil Co. and Farmers Union Central Exchange, Inc., both of Billings. Farmers Exchange would assume half of the estimated $450,000 pipeline cost, with the other firms paying 25 per cent each.

# Mid-East Prices Shift

## Esso Export posts 5-cent cut at Persian Gulf, 7-cent raise on Mediterranean; higher transport costs blamed

THE first changes in Middle East crude prices in more than 3 years came last week.

Iraq crude at the northern Persian Gulf port of Fao dropped 5 cents a barrel.

Postings for both Iraq and Arabian crude at eastern Mediterranean ports went up.

Higher tanker rates and the increased cost of moving crude through the Persian Gulf got the credit. Here's what happened:

**. . . A 5-cent reduction** in 32°-gravity Iraq crude, from $1.84 to $1.79 at Fao was announced by Esso Export Corp.

**. . . A 7-cent boost** in both Iraq and Arabian crudes of 36°-gravity delivered at the eastern Mediterranean ports of Tripoli, Banias, and Sidon was made by Esso Export at the same time the Fao reduction came. This pushed 36° crude offered by Esso to $2.46 from the $2.39 posting that has existed since 1953.

**. . . A 10-cent increase** in 36°-gravity Iraq crude loaded at the Mediterranean ports was announced by BP Trading, Ltd. the day following Esso's announcement. This puts the 36°-gravity Iraq crude at $2.49, or 3 cents a barrel higher than Esso's. At the same time BP offered 36°-gravity Iraq crude at Fao for $1.87, also a 5-cent reduction per barrel.

**. . . The 7-cent increase** at Mediterranean ports was met by Mobil Overseas Oil Co., Inc. (Socony Mobil) and Mid-East Crude Sales Co., Ltd. (Caltex).

Late last week the Royal Dutch-Shell Group and Cie. Francaise des Petroles, the other two major Iraq crude marketers, had given no indication whether they will go along with the changes. Industry observers believe BP will reduce its Mediterranean increase by 3 cents to meet the $2.46 price for crude set by Esso since other marketers followed Esso's lead in the smaller increase.

Prices for other Middle East crudes remained unchanged. The changes announced by the different marketing companies varied according to the gravity of the oil each has to offer. But generally it followed the 2-cent change per degree of gravity differential that is well established in Middle East crude pricing.

**Why it happened . . .** There were no official comments from any of the companies on the increases in the eastern Mediterranean and the reductions at Fao. But the changes generally are regarded as reflecting the effect of firmer and higher tanker rates.

With tanker rates going up, the 47-cents a barrel differential on 36°-gravity Iraq crude lifted at Fao instead of at the nearer-haul Mediterranean ports became less and less an inducement to make the long trip up the Persian Gulf.

The changes made in postings last week increase this price differential to 59 cents. The differential between the eastern Mediterranean and Ras Tanura on Arabian 36°-gravity crude has been 42 cents. This is increased to a spread of 49 cents by the new postings made by Esso.

**Pipeline costs up . . .** Another factor involved may be the recently renegotiated agreement between Iraq Petroleum Co., Ltd., and the Syrian Government.

It calls for increased pipeline royalties to Syria based on throughput of I.P.C.'s pipeline system across the country. The system connects Iraq's oil fields and the eastern Mediterranean oil loading ports. The changes in price postings also could affect similar demands by Lebanon for increased income because the system also traverses a portion of that country.

Trans-Arabian Pipeline Co.'s system goes to Sidon on the Mediterranean. Tapline renegotiated its agreement with Syria on the same pattern as I.P.C. Ras Tanura is a much shorter tanker haul than Fao, and the price differential for Arabian crude lifted in the Persian Gulf and Mediterranean was only 42 cents.

Basrah Petroleum Co., Ltd., the I.P.C. affiliate which operates the southern Iraq fields serving Fao, last year produced only about 148,000 bbl. daily. Compared with the more than 525,000 bbl. daily produced at Kirkuk, Ain Zalah, and Butmah which goes into the I.P.C. pipeline system, the volume of Fao oil with its reduced price isn't too great. Too, the posted price of Fao crudes has always been less than comparable Middle East oil because of the draft limitatitons and difficulty of crossing the bar in the Shatt-Al-Arab River with the additional port fees involved.

The last Middle East price changes were in July 1953, after U. S. crude prices were boosted 25 cents a barrel. At that time, Middle East operators boosted prices from 17 to 25 cents a barrel in the Persian Gulf and from 10 to 15 cents a barrel at the eastern Mediterranean ports.

# Iran Deal Studied

## Money woes lead country to seek increased output

THE 17 member companies in the Iranium consortium are studying Iran's request for increased crude production this year.

The participants, including 13 American companies having 40 per cent interest in the operation, are expected to deliver an answer this month after a meeting at The Hague.

Iran is asking for crude production above the levels agreed upon in 1954 because it needs money badly. The country's budget deficit may be as high as $60,000,000 when the fiscal year ends in March. One solution is to divert oil revenues earmarked for public projects such as dams, schools, hospitals, and factories.

But government leaders fear this might backfire. The public wants to see visible benefits from the oil industry.

Under the 1954 agreement, the consortium was committed to produce about 330,000 bbl. daily last year, 500,000 bbl. daily this year, and 640,000 bbl. daily in 1957. Iran's income during these years was estimated at about $90,000,000 for 1955, $135,000,000 this year, and $190,000,000 in 1957.

**Secret agreement disclosed . . .** Iran has an ace in the hole for increasing production.

According to reports from Teheran, Iranian officials have made public a secret supplement to the 1954 agreement. This supplement provides for discounts in posted crude prices to consortium members as incentives to increase production above the set levels.

The reports say a 5 per cent discount would be granted on the first extra 63,000 bbl. daily; 7½ per cent on the second 63,000 bbl. daily; and 10 per cent on the third 63,000 bbl. daily.

# Bolivia Seeks Capital

## State company more than fills domestic oil needs, but foreign money and know-how sought to speed development

BOLIVIA will make another effort next week to interest foreign oil companies in investing money and know-how to develop her small but healthy oil industry.

The government will begin accepting bids for exploration and/or development concessions in all parts of the country except the southeast. This region, which contains Bolivia's producing fields, has been reserved to Yacimientos Petroliferos Fiscales Bolivianos, the government company. Under terms of a new petroleum code signed last October by President Victor Pas Estenssoro, applications for acreage may be made February 25.

This is the first time since 1937, when Bolivia expropriated foreign properties, that the country has been thrown open to exploration. Bolivia tried previously to interest foreign operators in acquiring acreage on a lease basis from Y.P.F.B., but with a notable lack of success. Glenn McCarthy, Houston oil operator, was the only taker then.

Bolivia is unique in that she is the only country in the world meeting her domestic oil needs with a state-controlled operation. She needs only 4,000 bbl. to 5,000 bbl. daily to satisfy her own demand. Bolivia is now producing about 11,000 bbl. daily, with the prospect of a 17,000-bbl. daily production by the end of this year. The surplus is now being sold to Brazil, Argentina, and Chile.

Any oil discovered by a foreign operator would have to seek a market outside the country. The new oil code reserves local markets to Y.P.F.B. until that demand outstrips the state company's ability to produce. Landlocked Bolivia has no seacoast outlet for cheap transportation of any new production and much of the country is almost impenetrable jungle.

**Y.P.F.B. expansion . . .** In conjunction with the new era of seeking the favor of foreign investors, Bolivia has embarked on its own oil-industry expansion. The government company last December bought four new rotary drilling rigs in the United States and will have 11 rigs in operation when they go to work *(The Oil and Gas Journal, December 5, 1955, page 95)*.

The government company's fields at Camiri and Bermejo have boosted output sharply and over a relatively short period. The country produced only about 1,600 bbl. daily as recently as 3 years ago. The new rigs will be used both for developing these fields further and for exploratory drilling.

**Pipeline plans . . .** The Bolivian ambassador to the United States, Victor Andrade, revealed last week in New York that the country is seeking private capital to build a trans-mountain pipeline from near La Paz to the port of Arica in Chile. The 6,000-bbl. daily line has been under consideration for some time. Andrade said if the $10,500,000 necessary to build the line does not come from private capital, an effort will be made to obtain a loan from the U. S. Export-Import Bank.

Williams Brothers is now building a 220-mile, 6-in. products line linking Cochabamba, Oruro, and La Paz and has made some preliminary engineering studies for the trans-mountain line. The line to Arica would drop from 15,000 ft. elevation to sea level in the last 48 miles on the Pacific slope of the Andes. The contractor believes the pressure of crude moving down that sharp slope could be used to drive turbines and generate enough power to supply Arica's 30,000 population with electricity.

## Jamaica Search to Start

Geology and seismograph crews were en route to Jamaica last week to begin exploration on Jamaican Stanolind Oil Co.'s exclusive concession.

The firm, a subsidiary of Stanolind Oil & Gas Co., Tulsa, took over the prospecting license of Base Metals Mining Corp., Ltd., covering the island and its tidelands. The contract calls for spending $2,000,000 for exploration by June 21, 1958 *(The Oil and Gas Journal, January 9, page 74)*.

Photogeological work, core drilling, and shooting should be in progress soon. Jamaican Stanolind is negotiating for a rig to drill the company's first wildcat. Surface geology parties already are at work.

The Base Metals 1 Jamaica, only test ever drilled on the Caribbean island, was bottomed at 6,300 ft. after finding several encouraging oil and gas shows. It was drilled on a faulted anticline near the western tip of the island *(The Oil and Gas Journal, June 27, 1955, page 79)*. Seismic crews may look for a more favorable location on this structure.

# *International* BRIEFS

**Japanese oil importers have given** up plans to buy 700,000 bbl. of Russian crude from Baku.

The Japan Petroleum Refining Industry Association said that increased freight rates have offset reduced f.o.b. prices offered by the Soviets. The Japanese Government also refused to grant importers more than 20 per cent compensation for Russian crude, which made the deal even more unprofitable. Under present laws, importers can obtain extra foreign-exchange allocations for unprofitable oil imports. The government plans to abolish the system soon.

**Prices for crude oil from Boscan field** in Venezuela have been posted for the first time by Richmond Exploration Co., a subsidiary of Standard Oil Co. of California. Postings are $1.55 bbl. f.o.b. Richmond's station tanker at Punto Fijo and $1.52 bbl. for full cargoes at Bajo Grande. The crude is a 10°-gravity oil used for making asphalt.

**A wildcat well on Mafia Island, lo**cated off the East African country of Tanganyika, has been bottomed at 11,051 ft. D'Arcy Shell Petroleum Development Co. of Tanganyika, operator for the joint British Petroleum Co., Ltd., Royal Dutch-Shell Group venture, said the test yielded valuable geological information. The rig will be moved to Zanzibar for another test.

**Phillips Petroleum Co. has licensed** Ste. des Usines Chimiques RHONE-POULENC of Paris, to use its newly developed process for making rigid polyethylene. The agreement gives RHONE-POULENC exclusive use of Phillips patents and know-how to produce the new family of plastics in France.

**A new company, Ste. des Petroles** de Valence, has obtained exploration licenses for areas on the western edge of the French Alps. British Petroleum Co., Ltd., holds 30 per cent interest in the firm through D'Arcy Exploration Co. B.P.'s French associate, Ste. Francaise des Petroles BP, holds another 20 per cent interest. This is the first time that British capital has directly entered the oil search in France.

**The 32,000-ton Caltex Rotterdam, the** twentieth tanker completed in the postwar building program of California Texas Oil Co., Ltd., was launched recently at the Wilton-Fijenoord yard, Schiedam, Holland.

Railroaders are turning to lower-quality, or "economy" diesel fuels because these fuels are cheaper, and because there is not enough premium diesel fuel to go around. Tests show that all specifications may be relaxed somewhat without encountering undue operating difficulty. The problem of instability can be overcome by using nonmetallic additives. These additives also reduce the sparking problem.

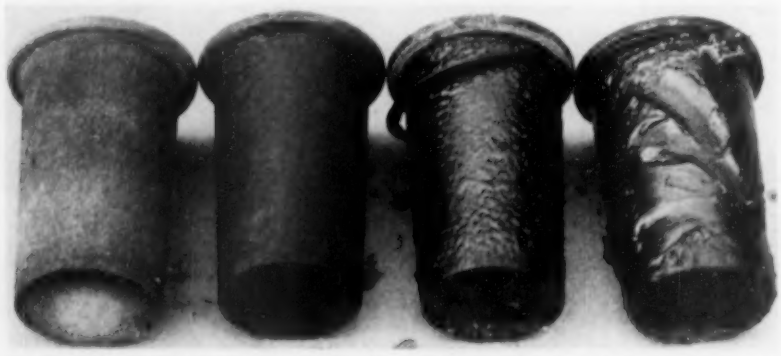
The author, with E. I. du Pont de Nemours & Co., shown boarding a B. & O. diesel locomotive, has chalked up many thousands of miles studying economy diesel fuels from coast to coast. In this article he tells why, so far as fuel oils are concerned . . .

# Railroads Shop at the Bargain Counter

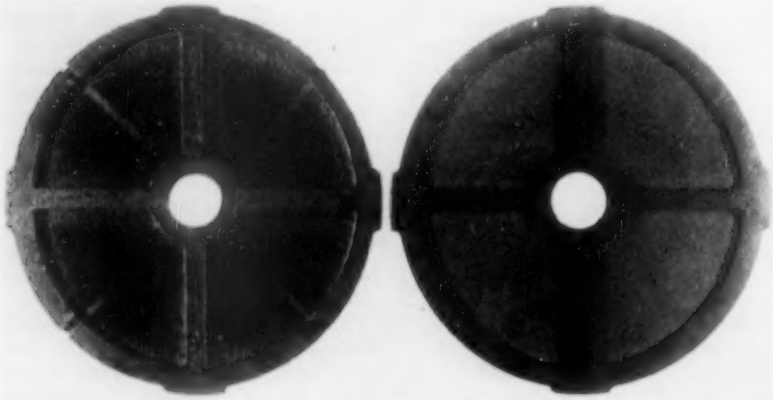
**by W. T. Robinson**

THE trend towards economy diesel fuel started shortly after World War II when the W.P.R.A. and the A.P.I. advised that in an emergency, sufficient 50 cetane straightrun fuels would not be available. Cooperative test work on low-cetane, higher-end-point fuels was initiated to prove to the railroads that locomotives would burn these lower-quality fuels.

This information alone did not result in the railroads searching earnestly for lower-grade fuels. What started the great interest in lower-cost fuels was the decrease in carloadings during 1953 and the dip in railroad earnings.



**SINTERED BRONZE FILTERS. Clean and with light, medium, and heavy deposits. Fig. 1.**



**PAPER FILTER ELEMENT used on railroad locomotive. Front is at left, and back is at right. Fig. 1-A.**

**High-cost item . . .** In reviewing ways to save money, it was evident that the price of diesel fuel had risen substantially since diesel-electric locomotives were first introduced. In fact, the percentage increase of the price of the middle-of-the-barrel distillates has been greater than for any other portion of the petroleum barrel.

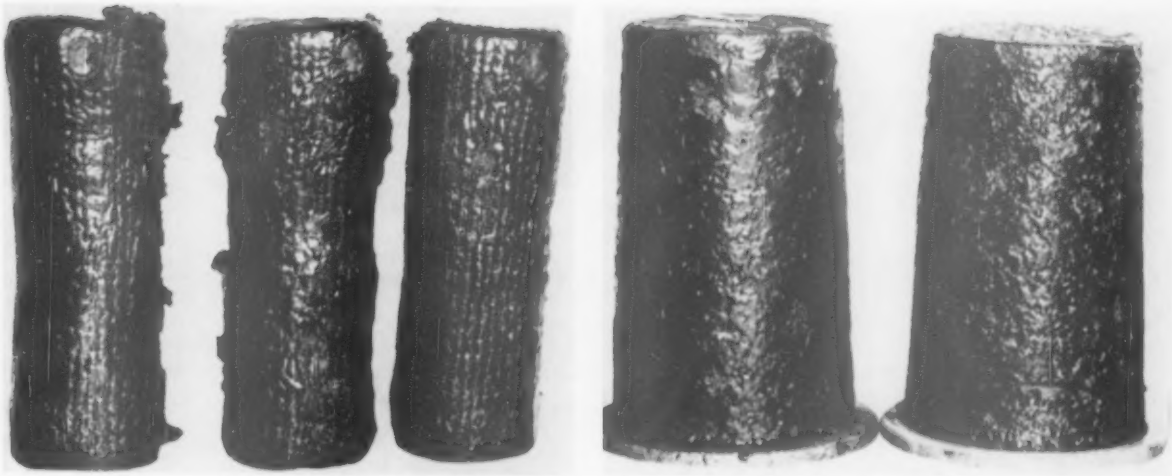
Diesel fuel also represents over one-half of the operating cost of a diesel-electric locomotive in freight service. So it was simple mathematics for a railroad using 150,000,000 gal. of diesel fuel to see that a saving of 1 cent a gallon would make the company $1,500,000 per year.

### Fuel Properties

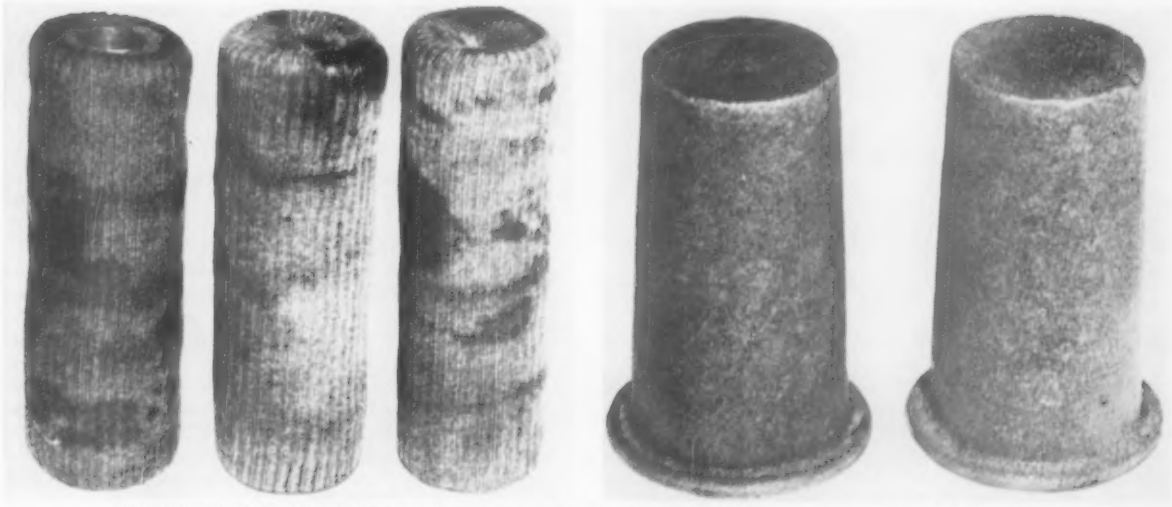
Some of the characteristics of diesel fuels that are important to the railroads are shown in Table 1, which includes the A.S.T.M. 2-D classification for these properties. Actually, most railroad specifications for conventional diesel fuels are considerably more restrictive than A.S.T.M. 2-D.

For example, where the A.S.T.M. classification lists 1 per cent sulfur as a maximum, most railroad specifications would not allow over 0.5 weight per cent. If a particular property of a fuel did not meet the railroad specification, a reduced price was sought and this was dubbed an "economy" fuel. For example, one rule of thumb in the railroad industry is that the price of a diesel fuel should be reduced 1 mill per gallon for each 0.1 weight per cent sulfur over 0.5 weight per cent.

This was sought to counteract expected increases in maintenance expenses resulting from the higher wear



**BADLY PLUGGED FILTERS** from a locomotice operated on unstabilized fuel. Fig. 2.



**ECONOMY FUEL WITH ADDITIVE** results in relatively clean filters. Base fuel is the same as Fig. 2. Fig. 3.

rates attributed to high-sulfur fuels.

**Economy-fuel properties . . .** The properties of one of the first economy diesel fuels which were widely discussed are shown in Table I in fuel "A." This fuel is actually a composite of four economy fuels, and the sample was taken from a wayside tank used for fueling locomotives. Savings of from ¾ cent to 4½ cents a gallon were made on the four fuels that make up the composite sample.

The blend was one of good cetane rating, moderately low pour point, moderate sulfur. The only real objection to this fuel, other than the high carbon residue value, was that its instability required the use of an additive to permit satisfactory operation.

**Stability . . .** The stability problem is common to most economy diesel fuels. Examples of a plugged paper filter element and sintered bronze filters, clean, with light, medium, and heavy deposits are shown in Fig. 1 and 1A. Residue formation in economy fuels results from the tendency of cracked constituents to be susceptible to oxidation and polymerization.

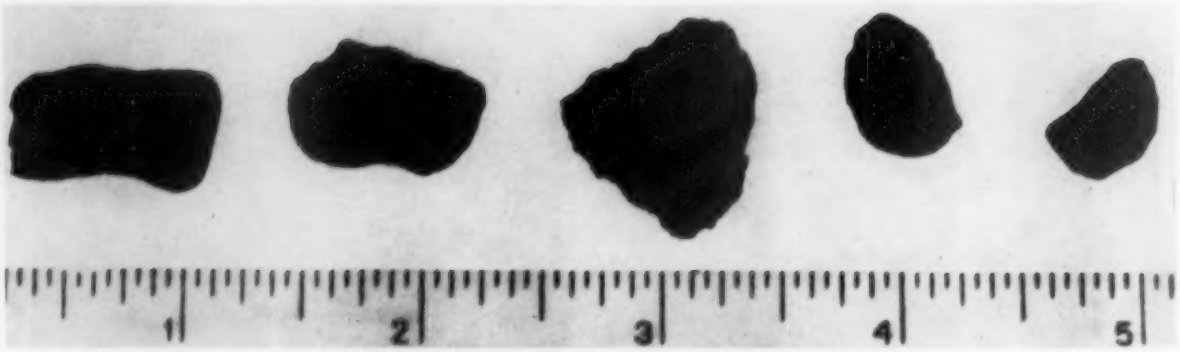
As illustrated in Figs. 1 and 1A, the buildup of the residue on filter elements and premature plugging of wayside filters can be expensive. It also can cause a road failure of a locomotive by stopping the fuel flow. The chemical reactions that lead to residue formation can also cause a "varnish" formation on the injectors, resulting in sticking.

Partial plugging of locomotive filters can reduce the flow of fuel to these injectors. Since many locomotive injectors are cooled by the recirculation of excess fuel, a decrease in fuel flow (fuel starvation) can cause overheating of the injectors and accelerate the sticking of the plungers.

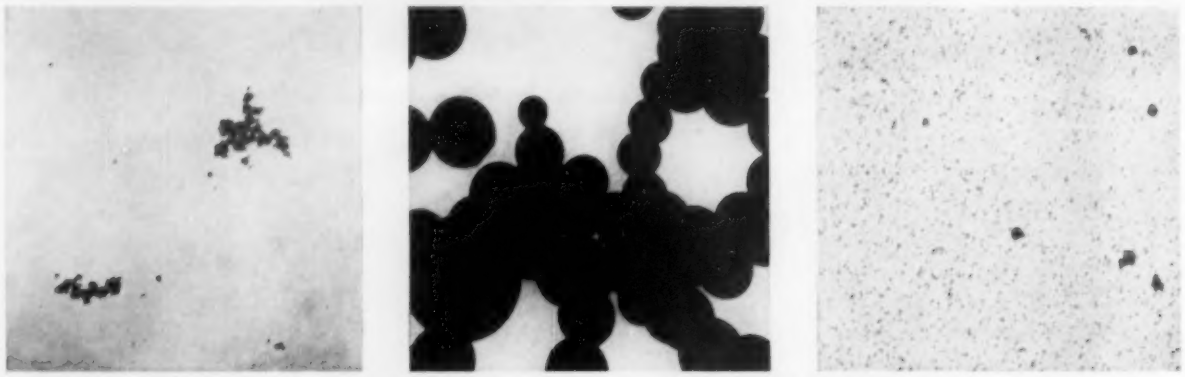
**Additives . . .** Those additives which are used in most economy diesel fuels do an excellent job of minimizing the paramount objectionable property of these fuels. The effect of one additive in an economy fuel is shown in Figs. 2 and 3.

In Fig. 2 the badly plugged string—wound and sintered bronze filters from a locomotive, which was operated on an unstabilized fuel, are compared to the relatively clean filters obtained when an additive was used in the same fuel shown in Fig. 3. The engine operated over twice as long on the fuel containing an additive than as the unstabilized fuel—and with much more successful results.

**Sparking,** another problem experienced with many low-grade economy fuels, is highlighted in Fig. 4, which shows sparks blown from the exhaust stack of a switching locomotive. Locomotive sparking results from the formation of carbon deposits during idle or while drifting downhill. These de-



PARTICLES BLOWN from the exhaust of a railroad locomotive. Fig. 4.



DIESEL FUEL BLEND before and after storage at 110° F. At left is fuel at start of storage time; center is fuel with no additive after 12 weeks' storage; right is fuel after 12 weeks' storage with additive, modified 2,730 times. Fig. 5.

posits are then ejected from the engine during periods of heavy load.

The glowing carbon particles are not only a potential cause of right-of-way fires, but are dangerous to railroad personnel in the vicinity of a locomotive. Recent tests have shown that certain metallic-type fuel-oil additives can cause excessive spark emission, but organic or ashless additives do not. This results from reducing the glow temperature of the carbon deposits in a fashion similar to preignition in an automobile engine.

The metallic additives can cause the carbon particles to be larger and of greater tensile strength. Field tests have shown that an ashless additive does not contribute to the sparking problem, but minimizes it.

**Other economy fuels . . .** We have mentioned one of the first economy diesel fuels and might look at other fuels being used in commercial operation by other railroads. Fuels B, C, and D, Table 1, have been used extensively. Two are moderately high in sulfur; one is low in cetane number—35; and another is high in end point—750° F., and in pour point, +30° F.

In commercial operation, all of these fuels have performed satisfactorily. A common denominator of the three widely varying fuels was the instability of the base fuel, which caused filter plugging and injector sticking.

**Stability evaluation . . .** To aid them in the evaluation of the stability of economy diesel fuels many railroads are using the electron microscope. Fig. 5 shows one of the resultant photomicrographs where a diesel-fuel blend was photographed originally and after 110° F. storage with and without a stabilizer. As demonstrated here, the electron microscope shows both deterioration in the fuel and the effect of a stabilizing additive.

The use of the electron microscope has caused some controversy and discussion relative to its application. This has been brought about because dispersion of particles is desired and large agglomerates are believed to be harmful, but no precise correlation between electron microscope results and field experience exists.

One desirable item for use in conjunction with this instrument is a procedure for accelerating the aging of a fuel for prediction of storage stability.

TABLE I—CHARACTERISTICS OF DIESEL FUELS

| | A.S.T.M. No. 2-D | Fuel A | Fuel B | Fuel C | Fuel D |
|---|---|---|---|---|---|
| Cetane number | 40 min. | 53.6 | 44 | 35 | 47 |
| Vis., S.s.U. at 100° F. | 32.0 min., 45 max. | | 39.0 | 39.0 | 42.2 |
| Pour point, °F. | 10° F. below ambient | +5 | +10 | +10 | +30 |
| Sulfur, wt. % | 1.0 max. | 0.49 | 0.79 | 0.81 | <0.2 |
| Carbon residue, wt. % on 10% bottoms | 0.35 max. | 0.54 | 0.01 | 0.40 | |
| Distillation range, °F. | 90% | 50%—510 | 90%—630 | 90%—610 | E.p.—750 |
| | 675 max. | E.p.—676 | E.p.—680 | E.p.—665 | |
| Stability | | Unstable | Unstable | Unstable | Unstable |

### What Are Economy Fuels?

Refiners differ in their opinions of the value of certain stocks with some selling heavy catalytic distillates for economy diesel fuel, and others placing a lower value on light thermal distillates or light cracked gas oil. Those with the smallest heating oil markets are more interested in economy diesel fuel than refiners supplying heating oil. As the railroads relax specifications, certain refiners have been able to minimize processing costs required for properties such as stability, low sulfur, and high cetane.

**Economics . . .** Available catalytic cracking capacity also may have an effect on economics. Refiners with a

reasonably consistent demand for gasoline and excess cracking capacity can reduce their conversion level and charge the straightrun distillate to the cracking unit. This makes the same amount of gasoline and more distillate at the expense of uneconomical items such as the coke deposit on the catalyst.

Selling one product for economy diesel and No. 2 home burner oil has some economical appeal in the reduction of distribution and marketing cost and the capital invested in storage tanks. Enough refiners have supplied lower-cost fractions as economy diesel fuels to cause other refiners to sell a premium product at an "economy" price.

**Tests on residuals . . .** In many discussions, residual components have been mentioned as one of the really low-cost refinery streams. This has brought action from the railroads, and residual blends are now being tested in many sections of the country. Almost all of these residual blends require preheating. The blend which has attracted the greatest interest has a viscosity of 300 S.s.U. at 100° F. These blends also have higher sulfur contents in the range of 2½ to 3 per cent sulfur and have high carbon-residue values.

Many of the tests are being conducted in locomotives which are equipped with dual-fuel systems to burn the residual blend at higher loads and a conventional economy fuel at lower loads or during idling.

While particular blends are normally selected for their stability, there is a potential problem of incompatibility among different residual blends. This is also a potential problem between the distillate fuel oil and the residual blend. Incompatibility can arise when blends are mixed inadvertently during fuel changeover on the locomotive.

Additive development and testing continues along with the testing of the newer low-cost blends to help solve some of these problems.

In determining the future of economy diesel fuels it is important to point out that more than half of the fuels consumed by the railroads presently have low cetane ratings. It appears then, that these economy diesel fuels will be the most widely used throughout the railroad industry.

Many railroads will continue to test, and probably to use residual blends. Railroads which can obtain premium diesel fuel blends at satisfactory prices will continue to use the higher-quality fuels.

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ELEMENTS OF FIELD PROCESSING—10

# Vane-Type Impingement Mist Extractors


**by John M. Campbell**


MOST production equipment involving the separation of oil and gas at present uses impingement-type mist-extraction elements. This element is usually of the vane type or of knitted wire, the former being shown in Fig. 1.

The vane type consists of a labrynth formed with parallel metal sheets with suitable liquid collection "pockets." The gas, in passing between plates, is agitated and has to change direction a number of times. Obviously some degree of centrifugation is introduced, for, as the gas changes direction, the heavier particles tend to be thrown to the outside and are caught in the pockets provided.

**How mist is removed . . .** Coalescence of small particles into those large enough to settle by gravity is provided by two mechanisms—agitation and surface. The surface of the element is usually wet and small particles striking same are absorbed. Inasmuch as the pockets are perpendicular to the gas flow, the liquid thus formed does not have to flow against the gas. Consequently, small compact units have a large capacity.

Although such units are generally very similar they differ in construction details, such as the two shown in Fig. 1. The design is largely empirical, and no correlations apply. Generally though, the manufacturers of such units guarantee the entrainment not to exceed 0.1 gal. per M.M.c.f. when incorporated into the top of a properly designed oil-gas separator.

**Designing for efficiency . . .** As the plates are placed closer together and more pockets are provided, greater agitation, centrifugal force, and collection surface are provided but the pressure drop is increased correspondingly. Thus, for a given flow rate, the collection efficiency is normally some function of the pressure drop.

In the average application this pressure drop varies from 1 to 10 in. of water. Because of this pressure drop


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PRODUCING

TYPICAL vane-type mist extractors. Fig. 1.

and to prevent gas bypassing the extractor, a liquid-collection pan incorporating a liquid seal is necessary for the liquid to drain properly.

This type of mist extractor is only generally efficient where the particle diameter exceeds 10 $\mu$. When small solid particles are encountered in the absence of liquid, the efficiency is generally low. Consequently, this type is regarded as primarily suitable for the separation of liquid.

**Properties of liquid important . . .** The density of the particle to be separated is an obvious variable. In addition, surface tension must be considered. For example, it has been necessary to use two mist extractors in series in glycol units since that material has a high surface tension. A portion of the glycol film "flows" over the metal surface propelled by the gas velocity. A portion of this film is then reentrained, to be caught in the second unit. In this case economics does not justify more than two units in series.

A second problem has been encountered where oil or condensate is brought into the contactor along with the gas. This liquid reduces both the density and surface tension of the entrained liquid and tends to increase losses. One solution has been to add a high density anti-foam agent to the glycol to reduce this loss. In one installation the loss was reduced from 29 to less than 0.5 lb. per M.M.c.f. by this means[3].

The above examples illustrate the effect of particle characteristics on mist extractor performance.

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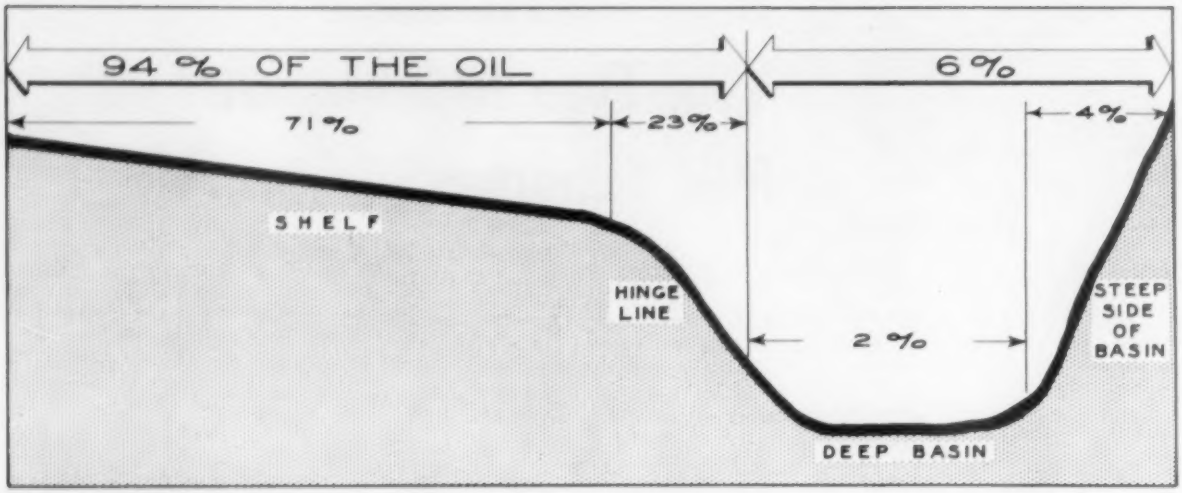



**POSITION** in depositional sedimentary basin in which non-communist world's oil (exc'uding Middle East) is found. (Data from G. M. Knebel's "Habitat of Some Oil").

Call it "jackpot geology," or invent your own term, but . . .

# Gear Your Thinking To Hunting the Big Oil Fields

## "Don't just look for oil; look for a major field." That was the Journal's advice in 1946—and it's even better advice now

**by Charles J. Deegan**

THERE is exciting news for oil men from the outposts of geological research. To shrewd and far-sighted operators, it means three things: (1) It promises that more of them will probably strike it really big rich in the next few years. (2) It promises that a new way of geological thinking will reduce the present odds against hitting the big jackpot. (3) It means that in wildcatting, the smaller operators will be able to compete with the majors on better terms than ever—this is of great importance.

Petroleum geology is definitely on the verge of a big scientific breakthrough. We are opening up new and vitally important ways of thinking about HOW, WHY, AND WHERE to hunt for the big oil fields. The best way to describe it is to call it jackpot geological thinking, or just jackpot geology.

Why gear your thinking to hunting the big oil fields? Why not just say oil field? First, because most of the big ones lie at drilling depths well within the reach of most independents. Second, because profits from little fields can't pay for all the dry holes and other costs of wildcat plays that fail. You can't keep on wildcatting from the profits of small fields and ever get rich. It takes at least one good lease in a major field to make any operator really big rich.

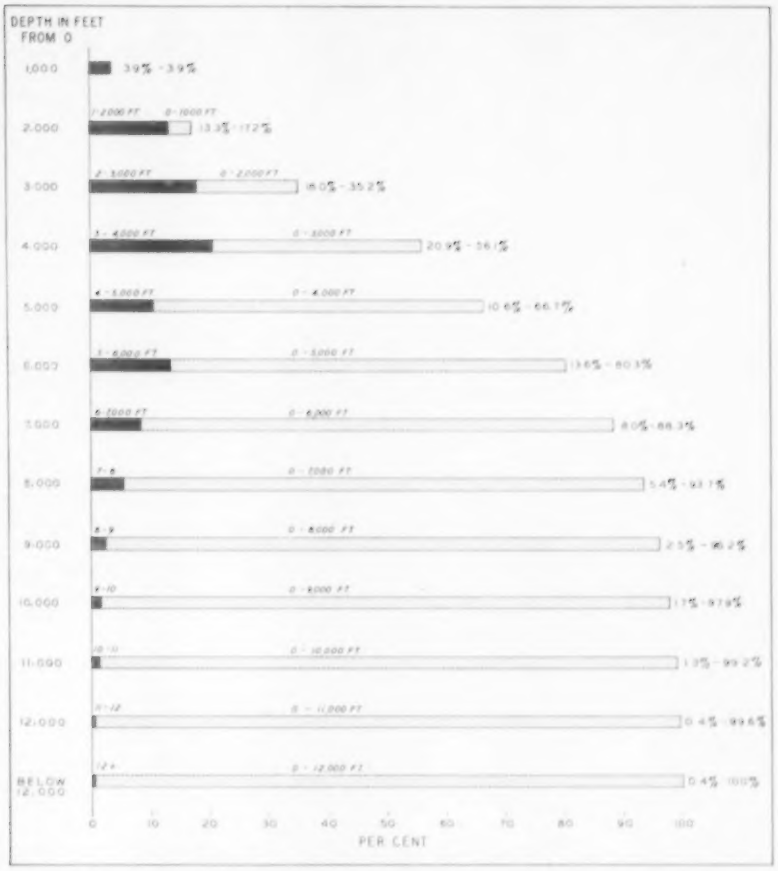
Jackpot geology is not a cure-all and it won't do away with all dry holes. The one-shot wildcatter will still have to depend mostly on luck. But operators who have some interest in as many as three or four wildcats almost every year will benefit greatly. They will find

**EXPLORATION**

### "Jackpot Geology" Is Ten Years Old

**The original discovery mentioned in this article was made by the author during his service as exploration editor of The Oil and Gas Journal between 1944 and 1950, and was published in the Journal. Charles J. Deegan is now an independent petroleum consultant in Dallas. A petroleum-engineering graduate of University of Pittsburgh, he served in Washington with the Petroleum Administration for War in 1941-44, following experience with Continental Oil Co. and Cities Service Oil Co. He is a full member of the A.A.P.G., the S.E.G., and the Petroleum Division, A.I.M.E.**

CHARLES J. DEEGAN




**PER CENT of non-communist world's oil (excluding Middle East), found by 1,000-ft. intervals of depth, plus total percentage to that depth. (Data from G. M. Knebel's "Habitat of Some Oil").**

their chances for a profitable strike improving year by year as jackpot geology develops.

The biggest shift in odds will come in rank wildcat territory. In producing trends that are well established, the odds will certainly improve, but to a lesser degree.

This breakthrough in petroleum geology is coming just when the same sort of thing is happening in many other fields of science. In geology, as in other sciences, it is the result of postwar research on some basic discovery.

The basic discovery, from which jackpot geology has now developed, was made by this author 9 years ago. In July 1946, while working for The Oil and Gas Journal, I discovered and published *(See The Oil and Gas Journal, July 26, 1946, page 46)* a key basic principle about oil fields in the United States. From the Drake well in 1859 up to 1946, many thousands of oil fields had been discovered. But my studies showed that a mere handful of these thousands, the big or major fields, had accounted for most of the oil. Each of these major fields contained at least 100 million barrels. Some, like East Texas, were much larger, but 100 million seemed to be about the dividing line on the low side. The combined oil of all the other thousands of little fields was only a minor part of the total oil found.

This 1946 discovery marked the birth of jackpot geology. It was only a beginning point. But it did give a clear direction to all research into the whys and wheres of oil fields. Instead of having to check their theories against actual conditions in thousands of U. S. fields, research men could concentrate on about 150 major fields. If an idea checked out in these, then apparent contradictions in small fields were not too important. Vice versa, no matter how good a theory looked in a lot of little fields, if it didn't stand up in the major fields, it wouldn't do.

### A Budgetary Disadvantage

Another great disadvantage for research men (and their budgets) was that they didn't have to start from scratch every time they wanted to check some theory against actual field conditions. The major fields had always attracted a lot of study, and there were numerous geological reports on most of them in the libraries. Many theories could be quickly checked right at a table in the library.

No one will ever know exactly how much research work has been done directly on the problem of where to find a major field. The financial rewards for even partial success are tremendous, even to a major company. Every big oil company in the world today owes its present financial position to the net profits from some good leases in one or more of these major fields. Every rich independent producer has made most of his oil money from a few leases in one or more of these fields.

Until quite recently only a few scraps of information from this research have been made public. The Oil and Gas Journal published about seven follow-up articles expanding and amplifying the original data. Dr. Shepard W. Lowman, then with Shell Oil Co., touched ligthly on the subject in one of his important papers. Dr. K. C. Heald, then with Gulf Oil Co., gave an important talk in Canada and published it in a paper. He extended The Oil and Gas Journal data very substantially. Then of course there has been a little private "dope swapping" among individuals.

But most of us who have been working on the jackpot-geology problem soon develop our own private dreams of getting rich some day by owning a small piece of a major field discovered through our ideas. So everybody has been holding back his best cards.

### Go After the Jackpot

Recently, however, Standard Oil Co. of New Jersey has released a substantial amount of data from its research work. G. Moses Knebel, of the Jersey company, is also the president of the American Association of Petroleum Geologists. He has been making the customary presidential tour, visiting local geological societies all over the United States and Canada. At each of these meetings he is delivering a tremendously important paper entitled "The Habitat of Some Oil."

In effect, Knebel is telling the geologists: "Don't just look for oil; look for a major field." Then he is presenting figures and geological information to prove why they should do so—plus some generalized clues about where to look. That boils down, in layman's language to thinking in terms of looking for the jackpot, or jackpot geology.

His primary means of making jackpot geology a new force in geological thinking is one simple statement of fact that hits like a sledge hammer. **In the**

**entire noncommunist world, just 236 major fields account for 82 per cent of all the oil ever found.** Of these fields, 175 are in North America.

Knebel's data now show that the 1946 discovery about U. S. oil fields also holds true all over the world. A comparatively few fields of about 100 million barrels and larger always contain the bulk of the oil to be found.

For most operators, Knebel's second most important discovery has to do with depth. Outside the Middle East, he finds the best chance to tap a major field is between 3,000 and 4,000 ft. In that one 1,000-ft. interval, you are shooting at 21 per cent of the total oil to be found. Between zero and 6,000 ft. you'll find 80 per cent of the total oil found. Below 6,000 ft. the prospects of uncovering a major field drop rapidly, and below 8,000 ft., no matter how deep you go, you are probably shooting at about 6 per cent of the oil.

### Unknown Factor at Work

Knebel believes there is some unknown factor at work that cuts the chance of finding much big oil at great depths. The amount of deep oil found is just too small, even after making allowances for the fact that fewer deep tests have been drilled. This unknown factor is loading the dice against the deep wildcatter.

There is a basic geological reason for these shallow depth ranges, according to Knebel. He shows that practically all of the world's oil is found in sedimentary basins; 42 of them to date, including 28 in North America. Most of the oil is found in two positions. One is on the shallow, gently sloping shelf of the original depositional basin. The other is at the hinge line, where the gentle slope breaks and starts to dip more steeply into the basin. The deep part of the basin and the steep side opposite the shelf seem to be less favorable. Excluding the Middle East, 71 per cent of the world's oil is on the shelf, plus another 23 per cent at the hinge line, with only 2 per cent in the deep basins, and 4 per cent on the steep side.

Because geologically 94 per cent of the oil is either on the shallow slope or at the hinge line, the best depths to find this oil are also shallow. This will make it easier for an independent using jackpot geology to compete with the big companies. Knebel doesn't say this, but his figures do.

His paper contains a wealth of other detailed information of tremendous value to alert and shrewd geologists. But for most operators, the size patterns in which oil is found and the depth ranges are the most important. These two alone will cause many a smart operator to take a new look at his whole exploration policy.

Jackpot geology is now ready for practical and immediate application. It is out of the research stage. The simple arithmetic of the odds in the Knebel data prove that. Operators who fail to recognize these odds will soon find their competitors have forged ahead of them.

The immediate practical problem facing operators and their geologists is this: How do we use jackpot geology to go about looking for a major field? Do we have to modify our present methods, and if so, to what extent?

Well, let's take a common-sense look at the problem. When a geologist starts out just to hunt for some oil, it is pure luck if he finds a major field. But if he uses jackpot geology, his first step is to do a lot of extra thinking about where conditions might be right to find a big one. Jackpot geology will definitely be more complicated than our present geological thinking. Luck will be less important and sound thinking plus shrewd analysis even more important than in the past. It's a little like fishing. Some men just go fishing; other men deliberately go fishing for bass. Over a year's time, which catches more bass?

Then there is still another item. When you think in terms of jackpot geology and deliberately start looking for a major field, you also improve your chances of at least finding a little field. The reason is simple. There are usually quite a few small fields in the general neighborhood of a major field. So even if your jackpot geological reasoning is only partly correct, you still have a better chance of hitting one of the little ones.

### Look at the Odds!

Look at the odds under our present system. In the United States on an average we find one major field for every 500 to 1,000 wildcats drilled, and we find only 1 profitable field for every 50 to 55 wildcats drilled. Unfortunately all so-called "successful wildcats" are not financial successes. A profitable field is one that nets a profit after returning drilling and other development costs plus operation expenses.

Operators who use good geology and geophysics do better than these averages, at least in finding some kind of an oil field. But no sane jackpot geologist will drop any of our present good tools. He will simply add new ways of thinking about where and how to use the good tools he now has. In jackpot geology you add new requirements to be met before you grade a prospect as worth testing. Therefore jackpot geology certainly can't make your odds worse than they are now against hitting some kind of a profitable wildcat. On the contrary, there are good reasons why your chances should be much better.

Suppose jackpot geology plus all the other good tools finds one major field per 250 wildcats instead of 500. Then it should also find at least one profitable field per 25 wildcats instead of one per 50, and it might do better than that.

Jackpot geology, on an average, should find the same amount or more oil with fewer dry holes. That can make quite a dent in average oil-finding costs. Assume you start from scratch with no production but a given amount of money with which to wildcat. Jackpot geology is more likely at least to let you find some profitable little fields fairly soon. These profits will let you drill more wildcats until you either hit that major field or eventually go broke. At worst you get a longer run for your money; at best you strike it rich.

### Conclusion

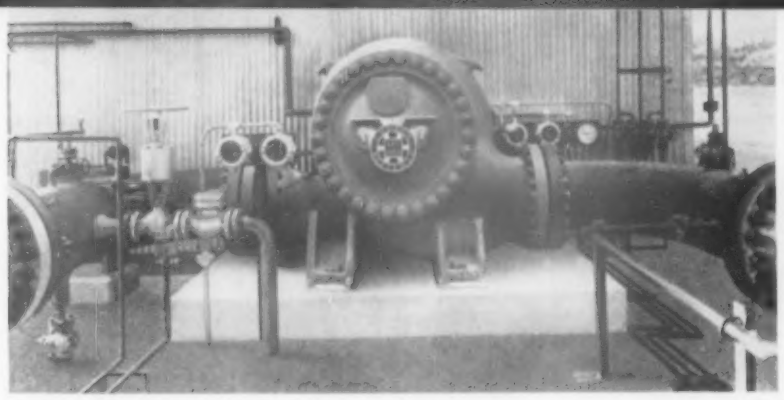
In jackpot geology we have a new, powerful, and practical tool for oil finding. Not too many years ago, Ira H. Cram, as president of the A.A.P.G., called upon his fellow geologists to use more "controlled imagination," predicting it would be a powerful oil-finding tool. Jackpot geology fits Cram's specifications very neatly.

Even in its present early stages, it increases the chances of any operator's striking it rich. At worst it should give him more hits in little fields with fewer dry holes.

It adds very little expense, if any, to his present exploration methods. It is primarily a new way of thinking and taking a new and different look at old facts. It is available to everyone, because an operator can hire some one of the consultants who have been thinking in terms of jackpot geology for years, or spend time and money retaining the thinking of his present staff —or both.

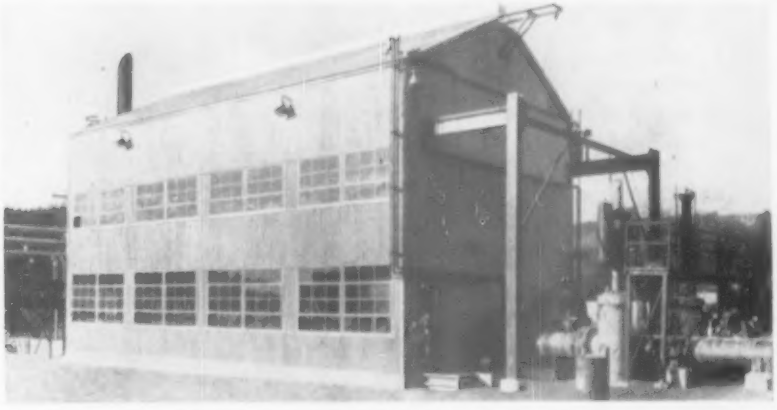
If your geologist has sound ideas about where to find a major field, with good luck, you could hit the big jackpot soon. If his ideas are only pretty good, and your luck only fair, you should still get your share of the little fields with fewer dry holes.

Jackpot geology, born in The Oil and Gas Journal in 1946, has grown up and is ready to go to work. Within the near future, some operator using jackpot geology is going to find another Yates, or Cushing, or Salt Creek, or East Texas, and it won't be pure luck. Will it be you?



## Gas Pipeline Industry's First Fully

# Automatic Engine-Driven Centrifugal Compressor



# Goes on Main-Line Service

**by D. M. Salls**

THE gas-pipeline industry's first centrifugal compressor driven by a fully automatic four-cycle gas engine is operating on main-line service for Gulf Interstate Gas Co. The unit is installed in a satellite compressor station near Stanton, Ky. It has facilities for operating unattended by remote control from another compressor station 80 miles away in Clementsville, Ky. Designed as a completely unitized installation, the unit operates entirely on its own auxiliary accessory equipment.

Development of the automatically controlled engine-driven centrifugal compressor unit is a joint accomplishment of Gulf Interstate Gas Co. and Cooper-Bessemer Corp.

Although four-cycle gas engines and centrifugal compressors have been used separately for pipeline transmission work for several years, this is the first time that both engine and compressor have been combined into a single unit for main-line service. Economies in installation, fuel, and maintenance costs resulting from the combination offer many significant advantages to pipeline operators.

The centrifugal compressor at Stanton is capable of handling over 500 M.M.c.f. of gas a day at discharge pressures up to 950 psi.

Driving the centrifugal compressor through a speed increaser is a Cooper-Bessemer Type LSV, 16-cylinder, 4-cycle gas engine that delivers up to 4,550 hp. The engine is spark-ignited, supercharged, and equipped with turbocooling, enabling it to operate at fuel economies of slightly over 6,000 B.t.u. per brake-horsepower-hour.

The author is with Cooper-Bessemer Corp. of Mount Vernon, Ohio.

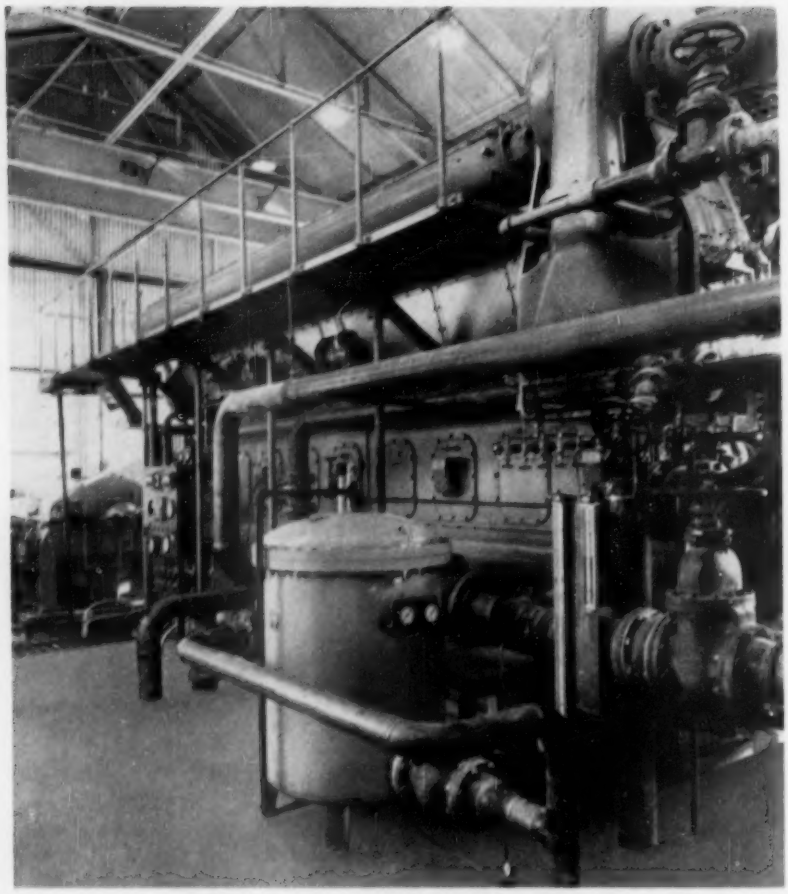
**Intake air cooling . . .** An operating feature of unusual interest is the use of turbocooling of manifold intake air. Expansion cooling of intake air through a turboblower system makes it possible to substantially increase the air-fuel charge to the engine. Resulting increases in horsepower are accomplished without corresponding increases in heat load on the engine itself. With expansion turbocooling, manifold air-intake temperatures are reduced without the high consumption of water as on conventional systems, a particular advantage where water is restricted.

Unusual compactness in design has been achieved by the engine-driven centrifugal-compressor combination. It requires simpler, less-expensive foundations than normally needed. For example, to duplicate the gas-pumping capacity would require two to five conventional compressor units.

With its ability to handle large volumes of gas, the unit at Gulf Interstate's Stanton station acts as a booster to help meet peak demands during winter periods by partially unpacking the line. In effect it duplicates the peak shaving benefits of underground storage. During normal periods, the heavy-duty engine-driven centrifugal unit operates as a conventional compressor.

### Future Remote Control

Gulf Interstate's satellite station is designed to be remotely controlled by direct wire, though at this time it has been operated only as a manned station. Equipment is provided for opening and closing line valves, starting the engine, cutting the engine compressor into the line, controlling engine speed, for setting station discharge pressures, cutting the compressor off the line, and shutting down the engine. Essential operations are telemetered to the main station. Sight and sound alarms signal



**POWER PLANT for the stations is the 16-cylinder supercharged gas engine which drives the centrifugal compressor mounted beyond the firewall at left.**

any malfunction at the main control panel at Clementsville and, where necessary, automatically shut down the unit.

**Compressor starting procedure . . .** To start Stanton station's automatic engine-driven centrifugal-compressor unit, controls initiated at the Clementsville panel first open the line suction valve. The blowdown valve is normally open when the station is off of the line.

After a period, the blowdown valve is closed and the line pressure builds up in the compressor case. The discharge valve closes, actuating a permissive start switch to energize the engine-starting circuit. Simultaneously, engine auxiliaries such as the oil-circulating pump are all initiated to circulate oil from the gear sump of the speed increaser through a gear oil heater.

The oil level is automatically maintained in the seal-oil tank for the centrifugal - compressor shaft seals. In event of low oil level, additional oil is automatically diverted from the gear sump.

Only when all auxiliaries are properly functioning and line valves correctly set can the main start switch actuate the engine-starting circuit.

Pushing the start switch button at Clementsville station initiates the engine-starting sequence by energizing the automatic control circuit of a three-way air-controlled valve to admit starting air to the engine. After the engine picks up speed and runs for a set purge period, the ignition is turned on. The fuel-gas safety shutoff valve and starting fuel valve are then opened admitting fuel to the engine. Only after the engine fires and reaches partial speed does the engine speed control switch energize the control circuit of the main fuel-gas valve. At the same time, starting air is shut off, and the main fuel valve opens.

At partial engine speed, gas pressure is admitted to the diaphragm of a three-way valve in the control air line to a shutdown cylinder on the gas regulating valve and to a pneumatic link in the governor control mechanism. With the gas regulating valve in operation and control air pressure on the pneumatic engine governor, the engine idles through a warmup period. After warmup, engine speed is regulated to a preset value by an automatic timer.

Once the engine is running at speed, line valves are opened in proper sequence to load the engine. The line discharge valve opens first. The line suction valve is then opened. Discharge pressures set on the control board at Clementsville are maintained automatically through the engine-speed governor. Discharge pressures are varied by regulating engine speed.

**Shutting down the compressor . . .** Pushing the "stop" button at Clementsville sets up the shutdown sequence. The main fuel-gas solenoid is deenergized closing the main fuel valve. The safety fuel gas valve then is closed. As engine speed drops down, line suction valves and discharge valves are closed. The ignition is grounded shutting off the engine. When suction and discharge valves are fully closed, the blowdown valve is opened, blowing down the compressor.

**Safety devices . . .** Shutdown safety devices sound the alarm and turn on a lookout light at both Clementsville and Stanton stations. The devices shut down the engine, close the side gate valves, and blow down the yard piping.

When shutdown is initiated by a break in the pipeline or fire in the supervisory or main building, the engine can be restarted only at Stanton. Malfunctions that shut down the engine but permit restarting at Clementsville are: overspeed of engine, low oil pressure, high discharge pressure, and high temperatures.

Safety devices are provided to sound alarms at both Clementsville and Stanton but not shut down the engine in the event of loss of fuel gas heater pilot (which shuts down only the fuel-gas heater); low oil level; loss of water pump seals; low water level; low air pressure, and low seal-oil level.

Trouble lights indicate loss of electric power within the station, loss of REA power, gas surge in centrifugal compressor, variation in discharge pressure of 5 psi. off set values, loss of telephone lines.

Functions telemetered to Clementsville are variation in suction pressure, discharge pressure, or starting air pressure; variation in engine r.p.m. and setting in discharge-pressure controller.

In addition to startup and shutdown from the remote station in Clementsville, Stanton station can be operated manually if desired. A complete switch panel is available to perform manual starting, with or without electric power from the REA system which is the lone source of supply to the station itself.

# Cathodic Tank Protection—5 Years Later

"Galvanic corrosion is the most serious type of corrosion affecting interior surfaces of steel vessels in contact with produced brine. This type of corrosion damage can be materially reduced, with reduction in operating expense, by cathodically protecting interior surfaces exposed to the produced brine."

**by R. D. Yingling**

## Here's How . . .

1. Determine the area of tank metal in contact with corrosive brine.
2. Calculate current requirements necessary to supply the correct current density. (At least 3 ma. per sq. ft. of exposed surface should be used. If corrosion is severe, 5 ma. per sq. ft. will probably be necessary.)
3. Determine the size and number of anodes necessary to give protection for an adequate period of time to eliminate frequent anode replacement. (Figure 450 amp.-hr. per lb. for magnesium anodes.)
4. Install anodes, making sure no direct contact with the tank exists, and install an insulated eyebolt or stud bolt so that an external circuit can be arranged.
5. Using a 0.01-ohm shunt and resistance wire in series connect the insulated anode bolt to the tank so that the calculated amount of current is applied by the anode. (Use a millivolt meter across the shunt to read current—10 mv. for each ampere of current.)
6. Check anode installation within a few days and adjust resistance if polarization has changed the current output appreciably.
7. Make periodic checks of all installations to make sure current is adequate for protection. Resistance wire will have to be removed as anode metal is expended.
8. When all resistance wire has to be removed to supply the correct current, the anode is nearly depleted. This is a good indication that a replacement anode will soon be necessary.

Author is production engineer, Gulf Oil Corp., Great Bend, Kans.

CORROSION prevention using expendable metal anodes was started by Gulf Oil Corp. in the Kansas area early in 1951. Due to the success of this program, practically all steel tanks handling corrosive brines in this area are now cathodically protected. At present, 36 steel vessels are included in the program.

**. . . Before** Gulf started the program, the average life of tanks receiving Arbuckle production was 5.2 years. Twenty-four of thirty-seven receiving tanks developed leaks in a 5-year period.

**. . . Since** cathodic protection was applied 4½ years ago, only 1 of the 36 tanks protected has required replacement.

A number of tanks had already been damaged by corrosion at the time cathodic protection was applied and developed seepage leaks shortly after anodes were installed. But these leaks were repaired and the tanks are still in service.

**Cost of corrosion . . .** The need for some type of corrosion prevention is readily apparent when past service is considered. A study of 37 steel receiving tanks during a 5-year period from 1946 through 1950 showed that 65 per cent of these vessels developed leaks during this period. The study also revealed that 50 per cent of the steel receiving tanks handling Arbuckle production had to be replaced during this same period. Based on 23 tank replacements, the average life of steel receiving tanks handling Arbuckle production was found to be only 5.2 years. Expense due to corrosion damage averaged $24.50 per month per tank.

Corrosion-damage costs were not compiled for other types of vessels handling corrosive brine. From experience, however, corrosion damage to other types of vessels such as heaters, water knockouts, and heater treaters is shown to be as severe as that found in receiving tanks.

**Protection of old tanks . . .** Since cathodic protection was started, only one tank which was under protection has been replaced. This tank was in very poor condition at the time cathodic protection was applied and the bottom had been covered with cement to stop numerous leaks. Of course, cathodic protection could not have been expected to materially increase the life of a tank in this condition. In fact, in certain cases where corrosion has seriously damaged a tank, installation of an anode will loosen existing scale, and leakage is likely to occur shortly after an anode is installed. If corrosion damage is not general but several isolated leaks have occurred, these leaks can be repaired and a tank life will be materially increased by cathodic protection.

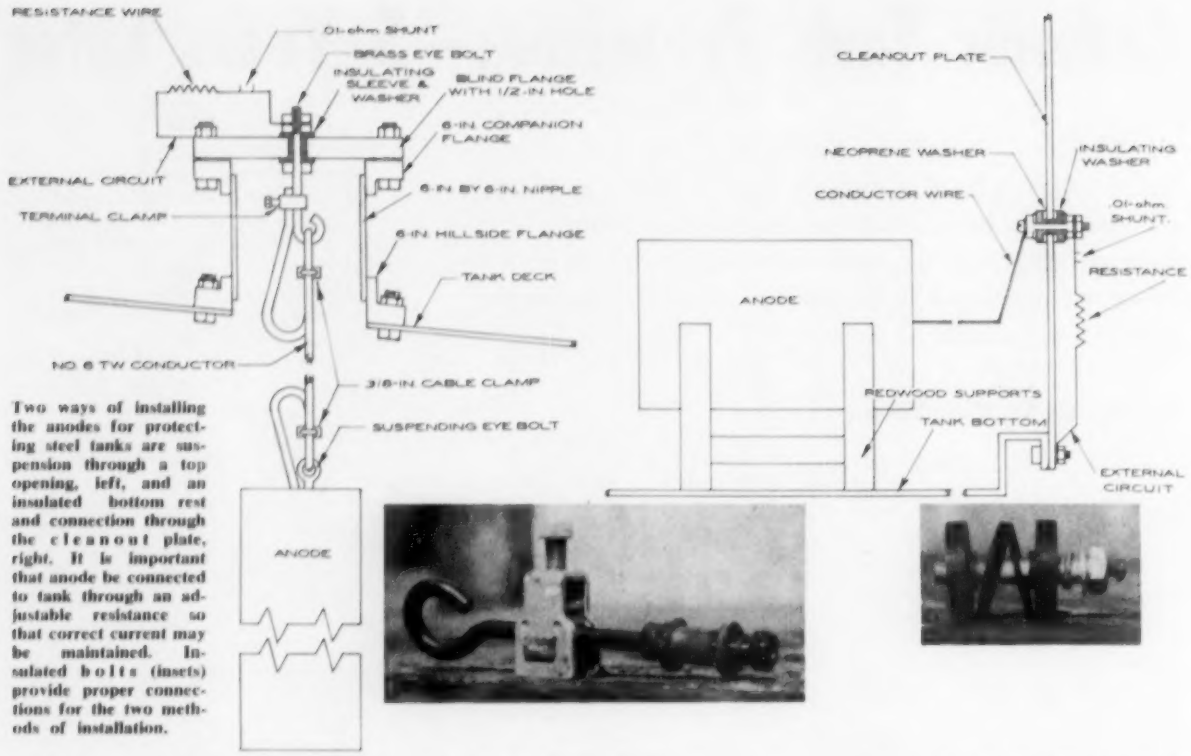
**Mechanism of galvanic corrosion . . .** The galvanic corrosion cell, as it occurs in a metal tank containing produced brine, can be compared to a simple battery in which two dissimilar metals are connected in an electrolyte. Current will flow from the more negative metal or anode to the more positive metal or cathode and will result in anodic metal being dissolved or corroded.

In steel vessels this dissimilarity may be caused by a number of factors such as mill scale, foreign inclusions, deep abrasions, fittings of different composition, and welds on the surface of the tank in contact with corrosive fluid. Current will flow from the anodic areas to the cathodic areas and will result in corrosion pits at the anodic area. The rate of corrosion will vary in different types of brine and is dependent on chemical composition of the produced water.

Placing in the brine a metal which is anodic to steel and is connected externally to the steel vessel will make the surface of the vessel cathodic. The expendable metal will be dissipated into solution and will provide a flow of current to all portions of the tank in contact with the brine. If enough current is provided by the expendable anode to counteract the current of the galvanic cells in the tank walls, corrosion will be stopped.

A number of metals can be used for cathodic protection, but due to economic factors involved, magnesium is generally used for expendable metal anodes in this type of installation.

Tests by anode manufacturers have indicated that a current density of 3 ma. per sq. ft. of exposed metal is




**Two ways of installing the anodes for protecting steel tanks are suspension through a top opening, left, and an insulated bottom rest and connection through the cleanout plate, right. It is important that anode be connected to tank through an adjustable resistance so that correct current may be maintained. Insulated bolts (insets) provide proper connections for the two methods of installation.**

sufficient to provide complete protection in sea water. Since produced brine is generally more corrosive than sea water, a current density of from 3 to 5 ma. per sq. ft. should be used to provide maximum protection. A current density of approximately 5 ma. per sq. ft. is used for Gulf tanks handling Arbuckle production in this area.

**Life of magnesium anodes . . .** Magnesium anodes will theoretically produce approximately 1,000 amp.-hr. per lb. of metal expended. However, due to localized corrosion on the surface of the anode, actual efficiency is about 40 to 50 per cent of theoretical. A value of 450 amp.-hr. per lb. of metal has been found to be a fairly reliable figure to use in computing the expected life of an anode. Thus, if an anode installation required 1 amp. of current to provide protection, a 50-lb. anode could be expected to give this protection for approximately 2.5 years.

**Details of anode installation . . .** The type of anode installation used is dependent on tank construction. Where possible it is generally desirable to suspend the anode through an opening in the top of the tank. With this type of installation replacement can be made without draining the fluid from the tank. The other method is to install the anode through the cleanout-plate opening and place it on insulated supports. The external connections are the same for both types of installations.

Details of the suspended anode installation are shown at left above. The long 50-lb. anode equipped with 20 ft. of No. 6 TW conductor is used and will pass through a 6-in. diameter opening. If no opening is available a 6-in. hillside flange is installed where necessary. A 6 by 6-in. nipple with a companion flange is installed in the hillside flange and the anode is suspended from a blind flange with a hole drilled in the center to accommodate an insulated eyebolt. The anode is attached to the brass eyebolt by a loop in the anode conductor wire which is secured with a ⅜-in. cable clamp. The end of the anode conductor wire is then clamped to the brass eyebolt to complete the circuit. The type of insulated eyebolt used in this area is shown in the inset photograph.

Details of the bottom-type installation are shown at right above. Short 50-lb. anodes are generally used and are installed through a cleanout or inspection plate opening. The anode is set on suitable supports, such as redwood or concrete, which will insulate the anode from the bottom of the tank. An insulated stud bolt, shown in the inset, is installed to provide a means of connecting the external circuit.

**Details of the external circuit . . .** In either type of installation, the anode and the anode lead wire must not touch any part of the tank except through the external circuit. If direct connection were made, an excessive amount of current would be produced and the anode would be dissipated within a few months. This excess flow of current is limited by installing a resistance in the external circuit. A length of resistance wire is generally preferred in this arrangement, since inexpensive variable resistors tend to become corroded and clogged with dirt and will not function properly after a short period of time.

Current measurements must be taken periodically to determine if the anode system is functioning properly, since as the anode dissipates, resistance will have to be varied slightly to maintain correct current density. A simple method of measuring this current is to install an 0.01-ohm shunt in the external circuit and use a millivolt meter to measure the current. A millivolt meter connected across this shunt will give a 10-mv. deflection for each ampere of current and can therefore be used directly to measure the current flow.

**Cost of cathodic protection . . .** The cost of cathodic protection is relatively inexpensive as compared to corrosion damage costs and will vary from $1.50 to $2.50 per month depending on the type of installation and area to be protected. Since corrosion damage is greatly in excess of this figure, cost of cathodic protection can be paid out with only a very short increase in tank life. Therefore, it is evident that a considerable savings can be achieved with a properly supervised cathodic-protection program.

by **Larry Resen**
District Editor

OPERATING REPORT . . .

# Nothing Stands Still at Suntide

PREFLASH TOWER was installed to relieve load on downstream units and permit increased throughput. Fig. 1.

## *Plant improvement started as first units went on stream*

SUNTIDE REFINING CO. began its operations at its Corpus Christi plant in early 1954 by immediately upping its crude-unit capacity on the shakedown run.

This action characterized the refinery's first 2 years, for plant and unit expansion, greater flexibility, and improved operations have highlighted these early months of its existence.

Now, entering its third year on stream, Suntide can look back to:

1. **Higher crude-throughput capacity.** The current 50,000-bbl. capacity is a healthy 90 per cent over the 26,300-bbl. design figure. A study has been completed and larger charge and product pumps are being installed to up the charge to 65,000 bbl. per day.

2. **Improved cat cracker operations.** Additional cyclone separators and use of high-alumina catalyst are two measures taken to increase efficiency. Preheat facilities planned will increase its capacity.

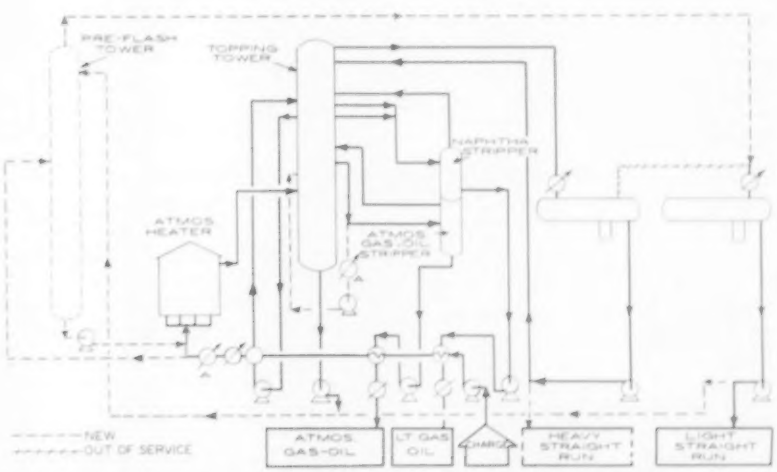
3. **A smooth running tetramer unit.** Close control has eliminated early difficulties, upped tetramer output.

4. **Trouble-free alky production.** Modification of defluorinator tower flow and substitution of alumina for bauxite pays off the HF unit.

Modification of the crude unit was accomplished by following two fairly common roads: Built-in capacity was more efficiently utilized to provide internal expansion and additional equipment was added to further up unit throughput. Additionally, use of segregated charge stocks was eliminated in favor of blended crudes.

In the initial planning of the plant, crude segregation was deemed to be the best way of handling charge stock to the unit. Thus low and high-gravity crudes would be segregated in storage tanks, and charged separately. Using charge stock A, for instance, gasoline output at design capacity of 26,300 bbl. amounted to only 2,104 bbl. and cracking stock 14,730 bbl. The higher-gravity charge stock B, however, produced 9,730 bbl. of gasoline and 7,360 bbl. of gas-oil for cracker feed. (Table 1).

This arrangement became impractical as unit capacity was increased. While part of the unit would be overloaded when processing a heavy crude, the remainder would not necessarily be running at full capacity. The reverse situation was the case when a light crude was charged. It became necessary to take advantage of all the built-in capacity in the unit, and segregated flow was discontinued. Incoming crude is




CAT POLYMERIZATION UNIT is being operated for production of propylene tetramer.

**FLUID CRACKING UNIT** has responded well to high-alumina catalyst charge.

**DEFLUORINATORS** were changed from parallel to series operation in the HF alkylation unit.

now blended and charged to the unit. Charge stock now ranges from 30°-33° gravity. A typical breakdown on products may be seen in Table 2.

On segregated charge, the volume of straightrun gasoline produced varied from 12.5 per cent of the light crude charged to 7.9 per cent of the heavy crude charged. Mixed crude, meanwhile, averages 22.3 per cent (Case 2, Table 2) straightrun.

**Preflash . . .** Major addition to the unit was the preflash tower installed upstream of the atmospheric heater (Fig. 1). Charge now goes directly to the tower (instead of the heater) where light straightrun gasoline is recovered. Load on the downstream units is thereby relieved permitting the increased throughput. The same furnace facilities are used, but charge is first flashed in the preflash tower and only the bottoms are sent to the atmospheric heater.

The lighter load on the heater permits it to be used to make up any deficiencies in heat exchanger capacity resulting from the modifications.

Suntide broke away from its use of dual condensers on topping tower overhead. In original layout, a two-stage condensing system was used with the first stage used for reflux and the second stage for product accumulation. The preflash tower was fitted into the operation by pulling the second-stage accumulators out of topping-tower service and using them to recover preflash overhead. The first-stage accumulators, meanwhile, now serve as single-stage receivers for the topping tower.

Product variety in the gasoline range has been increased. Where before only one gasoline product was available, it is now broken down into a light and heavy stock by means of the preflash tower.

**Cat cracker . . .** Meanwhile, flexibility as well as increased fresh feed and improved operations have played their respective parts in the cat cracking unit modifications. Additions to the unit included a gasoline splitter in the gas-concentration unit and a second stage of cyclones in the regenerator. A significant change has been the addition of high alumina catalyst into the unit.

Data showing the effect of adding cyclones are given in Table 3. Catalyst loss prior to cyclone changes ran 3.67 tons for the preceding 24 hours at a rate of 0.578 lb. per bbl. of virgin gas oil. The cumulative average loss of 1.06 lb. per bbl. of virgin gas oil represents a period of about 1½ years and increased losses for all causes including initial startup.

With the additional catalyst recovery units installed, the catalyst loss dropped. Typical data show a 2.0-ton loss for 24 hours at a 0.32 lb. per bbl. of virgin gas-oil rate. Cumulative average loss was 0.80 lb. per bbl. of virgin gas oil. As shown in Column C the loss rate has remained about the same at 0.30, with high-alumina catalyst in the unit. The cumulative loss, for a period of 170 days, averaged 0.72. During this 170-day period, low-alumina catalyst was in the unit about half the

**TABLE 1—DESIGN PRODUCT DISTRIBUTION (SEGREGATED CHARGE)**

| | A | B | C |
|---|---|---|---|
| Crude charge | 26,300 | 26,300 | 26,300 |
| Gasoline | 2,104 | 9,730 | 9,730 |
| Jet base fuel | 7,890 | | |
| No. 1 distillate fuel | | 8,680 | |
| Diesel fuel | | | 9,995 |
| Cracking stock | 14,730 | 7,360 | 6,045 |
| Residue | 1,576 | 530 | 530 |

**TABLE 2—CRUDE UNIT OPERATIONS (TYPICAL)**

(All figures barrels per day)

| | Light crude 40° A.P.I. Seeligson | Heavy crude 24.4° A.P.I. Placedo | Mixed crude, 32.9° A.P.I., Seeligson-Placedo (1) | Mixed crude, 32.9° A.P.I., Seeligson-Placedo (2) |
|---|---|---|---|---|
| Charge | 40,000 | 30,000 | 43,057 | 51,010 |
| Light straightrun | 9,400 | 960 | 4,395 | 6,530 |
| Heavy straightrun | 3,600 | 1,410 | 4,791 | 4,860 |
| Diesel | 17,600 | 11,130 | 15,523 | 20,840 |
| Atm. gas oil | 3,800 | 9,480 | 9,032 | 9,830 |
| Vacuum gas oil | 4,870 | 4,740 | 5,656 | 6,910 |
| Residue | 680 | 2,200 | 2,603 | 2,800 |

(1) Operation after preflash installation 32.9° A.P.I. crude. (2) Operation (maximum to date) after adding new pumps, cleaning equipment, adding larger impellers, using new booster pump, etc.

time, after which addition of high alumina began.

**High alumina . . .** In the runs with high-alumina catalyst, the unit has been operating at a higher fresh-feed charge rate. Typical data (Column C) show a raw oil charge of 15,040. As part of these operations, recycle ratio has been dropped from an average 1.1:1 to a 0.7 ratio average. In the example chosen, a 15,040-bbl. charge rate had 9,350 bbl. of recycle for a 0.622 ratio.

Significant comparisons contrasting operations before and after may be found by noting various data. At the time data were collected, alumina content of the catalyst charge to the unit had increased from 13 per cent to 21 per cent. Conversion remained close to that existing with the low-alumina content; 70.7 per cent before and 69.1 per cent after. Unit catalyst inventory in both regenerator and reactor totaled 82 and 86 tons respectively. These compare with 70 tons inventory being held with high-alumina content. Catalyst-to-oil ratio was 10.8 and 10.1 in the two "before" columns and dropped to 8.7 with the increased alumina.

Reactor-bed temperature in the high-alumina run was lowered to 888° F. as compared with 904° F. in the two "before" instances. A considerable difference will be noted in the use of stripping steam. It ran 5,160 and 5,280 lb. per hour in the two "before" columns and dropped to 3,080 lb. per hour. Another sharp change was noted in the carbon dioxide-carbon monoxide ratio. It dropped from 1.81 and 1.67 to 0.94. A final comparison will find the U.O.P. weight activity also sharply changed. It increased from 26 and 28 to a healthy 41.

**Preheat . . .** A study was made to determine the effect of feed preheat on cat-unit operation. Atmospheric and vacuum gas oil from the crude unit were brought directly to the cat-charge pumps instead of going to storage. By blocking off the water on the gas-oil coolers in the crude unit, a maximum preheat of 312° F. was obtained in the virgin gas oil. The results of the operation at slightly less than maximum preheat are summarized in Column D, Table 3, and as follows:

1. Catalyst circulation dropped which resulted in better differentials across the spent-catalyst slide valves.

2. Air rate was reduced with a resultant reduction in catalyst losses.

3. Due to better differentials, more stripping steam could be utilized resulting in better stripping and a lower weight per cent coke based on barrels of virgin gas oil charged. Note decrease in weight per cent $H_2$ on coke.

4. The amount of fuel gas went up due to higher reactor temperature.

5. No appreciable changes in product distribution were noticed.

As a result of this study, plans were drawn up which call for the installation of a preheat furnace which will increase the catalyst-unit charge rate to 25,000 bbl. per calendar day at a lower conversion.

**Alkylation unit . . .** In the HF alkylation unit, two minor changes were made involving the defluorinators. Operation of the unit has increased from a design charge of 2,000 bbl. per day to almost 3,000 bbl. (Table 4).

In the original startup, the U.O.P. unit was charged with bauxite in the two defluorinator towers. These were arranged in parallel with one being on standby and the other in operation, with a switch being made in the regeneration cycle. Under these conditions, a silicon migration was being experienced, with some lines becoming plugged and a few control valves going out of service.

To alleviate this condition, the bauxite which had a 2-3 per cent silica content was replaced with activated alumina with only a 0.1 per cent silica content. As a further step, the two towers were rearranged to operate in series. With

**TABLE 3—CAT CRACKING UNIT OPERATIONS**

| | A<br>Before cyclones (bbl.) | B<br>After cyclones (bbl.) | C<br>High alumina catalyst (bbl.) | D<br>Preheat |
|---|---|---|---|---|
| Raw-oil charge | 12,699 | 12,606 | 15,040 | 17,000 |
| Light cycle oil | | | | |
| Heavy cycle oil | 15,008 | 15,440 | 9,350 | 10,080 |
| Total charge | 27,707 | 28,046 | 24,390 | 27,080 |
| Recycle ratio | 1.182 | 1.225 | 0.622 | 0.593 |
| Debutan. light gasoline | 5,068 | 5,364 | 5,277 | 5,926 |
| Heavy gasoline | | | 1,176 | 1,075 |
| Butanes | 1,674 | 2,228 | 2,661 | 2,417 |
| Propanes | 650 | 850 | 1,038 | 1,257 |
| Light cycle oil | 3,767 | 3,468 | 3,557 | 4,138 |
| Heavy slurry oil | 428 | 226 | 1,080 | 1,140 |
| Fuel gas (M.c.f.) | 2,616 | 3,684 | 3,378 | 4,560 |
| Conv., per cent | 66.0 | 70.7 | 69.1 | 69.0 |

**Catalyst Inventory (Tons)**

| | A | B | C | D |
|---|---|---|---|---|
| Regenerator | 67.0 | 64.0 | 56.0 | 49.4 |
| Reactor | 15.5 | 22.5 | 14.0 | 15.0 |
| Loss in 24 hours | 3.67 | 2.00 | 2.25 | 1.75 |
| 24-hour loss, lb. per bbl. virgin gas oil | 0.578 | 0.32 | 0.30 | 0.21 |
| Average loss to date, lb. per bbl. virgin gas oil | 1.06 | 0.80 | 0.72 | 0.67 |

**Reactor Data**

| | A | B | C | D |
|---|---|---|---|---|
| Pressure, psig. | 17.6 | 15.0 | 13.7 | 16.3 |
| Virgin oil temperature, °F. | 108 | 80 | 136 | 255 |
| Comb. feed temperature, °F. | 390 | 372 | 280 | 374 |
| Bed. temperature, °F. | 904 | 904 | 888 | 908 |
| Cat/oil ratio | 10.8 | 10.1 | 8.7 | 7.9 |
| Cat circ., tons per hour | 1,964 | 1,898 | 1,422 | 1,433 |
| Stripping steam, lb. per hour | 5,160 | 5,280 | 3,080 | 3,996 |
| Stripping steam per ton circ. cat. | 2.62 | 2.78 | 2.17 | 279 |

**Regenerator Data**

| | A | B | C | D |
|---|---|---|---|---|
| Dilute phase, °F. | 1,150 | 1,175 | 1,169 | 1,179 |
| Dense temperature, °F. | 1,123 | 1,144 | 1,152 | 1,163 |
| Stack temperature, °F. | 1,210 | 1,242 | 1,210 | 1,215 |
| Pressure, psig. | 23.0 | 21.1 | 19.6 | 22.0 |
| Wt. per cent carbon on reg. cat. | 0.56 | 0.63 | 0.55 | 0.48 |
| Cat activity—U.O.P. | 26.0 | 28.0 | 41.0 | 42.0 |
| Flue gas: | | | | |
| Per cent $O_2$ | 0.3 | 0.2 | 0.2 | 0.3 |
| Per cent $CO_2$ | 11.6 | 12.2 | 9.1 | 9.8 |
| Per cent CO | 6.4 | 7.3 | 10.3 | 11.0 |
| $CO_2$/CO ratio | 1.81 | 1.67 | 0.94 | 0.89 |
| Net regen. air, s.c.f.m. | 44,800 | 46,900 | 51,220 | 50,170 |
| Wt. per cent $H_2$ in total coke | 11.1 | 8.3 | 9.5 | 8.0 |
| Carbon burned, lb. per hour | 14,830 | 17,070 | 19,310 | 19,620 |
| Total coke, lb. per hour | 16,680 | 18,610 | 21,340 | 21,330 |
| Coke, wt. per cent virgin gas oil | 9.9 | 11.1 | 10.8 | 9.5 |
| Gravity, °A.P.I. virgin gas oil | 24.0 | 23.5 | 25.0 | 24.0 |
| Alumina, per cent | 13 | 13 | 21 | 23 |

both functioning at the same time this way, the charge stream is, in effect, subjected to a double pass in the defluorinators. Under this arrangement, the upstream tower is subjected to the more severe service while the second one in series serves mainly as a backup to remove traces of fluorides which might possibly carry over.

Regeneration is accomplished by pulling the upstream tower off the line temporarily. During this period, the backup tower handles the stream, as in the original operation. In the regeneration step, the tower is recharged with fresh alumina. The regenerated tower is then put into the system as the backup tower, with the former becoming the upstream tower. This cycle is repeated with each tower alternating as the upstream and backup defluorinators. Regeneration is begun whenever 13.5 weight per cent of fluorides is removed from the stream.

**TABLE 4—HF ALKYLATION UNIT**

| Contractors— | Low $C_5$ | Current |
|---|---|---|
| Cont. temp. out °F. | 96 | 109 |
| Isobutane chg., bbl. | 409 | 567 |
| B-B, bbl. per day | 2,809 | 2,979 |
| Vol. per cent olefins | 38.8 | 41.7 |
| Vol. per cent $C_3$ | 2.6 | 1.4 |
| Vol. per cent $iC_4$ | 57.5 | 47.2 |
| Vol. per cent $C_5$ | 1.2 | 13.1 |
| Recycle, bbl. per day | 6,972 | 8,040 |
| Liq. vol., per cent $C_3$ | 15.0 | 3.4 |
| Liq. vol., per cent $iC_4$ | 82.6 | 91.1 |
| Lt. alky./olefin ratio | 1.45 | 1.58 |
| Isobutane/olefin ratio | 6.77 | 7.03 |
| Defluorinator towers: | | |
| Comb. fl. in, wt. per cent | 0.025 | 0.015 |
| Comb. fl. out, wt. per cent | 0.0010 | 0.0005 |
| Regenerator: | | |
| Wt. per cent HF | 88.7 | 90.5 |
| Wt. per cent water | 0.5 | 0.7 |
| Regen. acid: | | |
| Wt. per cent HF | 91.2 | 93.7 |
| Wt. per cent water | 0.4 | 0.5 |
| Products: | | |
| Butane, bbl. per day | 419 | 612 |
| Lt. alky., bbl. per day | 1,579 | 1,959 |
| R.v.p. | 3.7 | 3.7 |
| End point | 313 | 330 |
| F-4/4.6 cc. | 146.8 | 143.6 |
| Heavy alky., bbl. per day | 93 | 51 |
| Propane, bbl. per day | 36 | 40 |
| Acid Cons.: | | |
| Startups, shutdowns, troubles—over-all 0.63 lb. per bbl.; minimum 0.21 lb. per bbl.; average 0.5 lb. per bbl. | | |

**TABLE 5—POLYMERIZATION UNIT OPERATIONS**

| | Early runs (bbl.) | Currently (bbl.) |
|---|---|---|
| Charge | 1,092 | 1,090 |
| Cat. poly gasoline | 165 | 75 |
| Tetramer | 185 | 331 |
| Heavy tetramer | 21 | 21 |
| L.P.G. | 491 | 266 |
| Br. number | 60+ | 118 |
| Per cent olefins: | | |
| Fresh feed | 68.9 | 61.8 |
| L.P.G. | 3.0 | 7.5 |
| Conversion | 98.1 | 95.0 |

Good operating run: 154 days
Gal. tetramer/lb. cat. = 61.58
Gal. tetramer + poly/lb. cat. = 75.4
Pressure drop = 32 psi.

**Amylene charge . . .** In reviewing the operating condition, it will be seen the volume per cent of amylenes in the charge stock varied considerably. In the typical examples selected amylene content of the charge (B-B) stream varied from 1.2 to 13.1 volume per cent. The amount of this included in the charge is dependent primarily on the availability of the B-B's, with the latter naturally being preferred. It is of interest, however, to compare operating conditions with both the high and low $C_5$ content.

In the charge with the low $C_5$ content, the volume per cent of olefins was somewhat less than the high $C_5$ stream—38.8 vs. 41.7. The isobutane content of the charge was much higher, being 57.5 volume per cent in the low $C_5$ charge and 47.2 volume per cent in the high $C_5$ charge. This was supplemented with 409 bbl. and 567 bbl. of isobutane in the low and high streams, respectively. Higher recycle rates were maintained in the high operation, and the isobutane/olefin ratio was also higher, being 7.03 as against 6.77 for the low stream.

Yields of light alkylate computed against the total B-B charge stream were higher with the greater $C_5$ content, being 65.8 per cent against 56.7 for the low. This is on the basis of a 3.7-psi. R.v.p. The higher yields were offset by a lower performance number for the high $C_5$ stream. It had an F-4 performance number of 143.6 with 4.6 cc. of lead while the low stream had a 146.8 number (leaded).

Acid consumption on the unit has not been broken down on the basis of charge stock. An indication of operation may be seen in the cumulative consumption averaging 0.63 lb. per bbl. of alkylate. This includes acid consumed during startups and shutdowns as well as upsets in the unit.

**Cat poly unit . . .** An interesting aspect of the plant is the operation of the poly unit also of U.O.P. design. Suntide operates the poly unit primarily for propylene tetramer production. In its early operations, the unit operated to produce about 15.4 per cent poly gasoline and 18.9 per cent tetramer on the basis of total charge (Table 5). It was assumed that high-severity operations would result in good conversions. In the early operations, the temperature was thus gradually increased. However, while conversion was increased to about 98 per cent, the net result was a higher degree of conversion to poly gasoline and a low amount of tetramer produced.

It was decided to go in the other direction, and milder temperatures were used. Five propane quench zones are used in the catalyst chamber and these were carefully controlled. At the same time the bromine number of the recycle was used to control the process. A low Br number indicates a nonreactive recycle containing mostly unsaturates. A high Br number meanwhile means a low amount of poly gasoline will be produced with a high amount of tetramer. In practice conditions are controlled to achieve the high number mainly through maintaining a low bed temperature. During initial startup, each cat poly reactor was charged with 18,400 lb. of catalyst. This was later reduced to 14,500 lb. which gave a milder reaction and enabled the plant to maintain a high Br number.

A minimum bromine number of 90 is held, with it running between 100 and 115 on the average. In typical runs, with a charge of 1,090 bbl., a bromine number of 60 resulted in the 18.9 per cent of light and heavy tetramer, at a conversion of 98.1 per cent. This was accompanied by the relatively high yield of poly gasoline. With the same charge and holding a bromine number of 118, tetramer yield increased to 32.3 per cent of charge at a conversion of 95.0 per cent. Poly gasoline dropped to 6.9 per cent of charge.

Experience was also gained which dictated the need for closely watching the pressure drop across the catalyst cases. If the pressure drop increased too much, it was difficult to blow the cases out when recharging. At the same time, a sudden increase in pressure drop can result with aged catalyst. This because the crushing strength decreases as the catalyst ages. A sudden change can cause it to pack down, thereby causing a sharp pressure drop increase. By closely observing the increase in pressure drop and changing cases before it gets too great insures smooth unit performance and ease of recharging. As operating experience increased on this unit, its operation has lined out smoothly. On last operating run of 154 days, pressure drop was allowed to increase to 32 lb. During this period, 61.58 gal. of tetramer were realized per pound of catalyst and 75.4 gal. of tetramer and poly gasoline realized per pound of catalyst.


### Acknowledgments

Cooperation of the management of Suntide Refining Co. in the release of these data together with the information and assistance of C. E. Bochow in its compilation is hereby gratefully acknowledged.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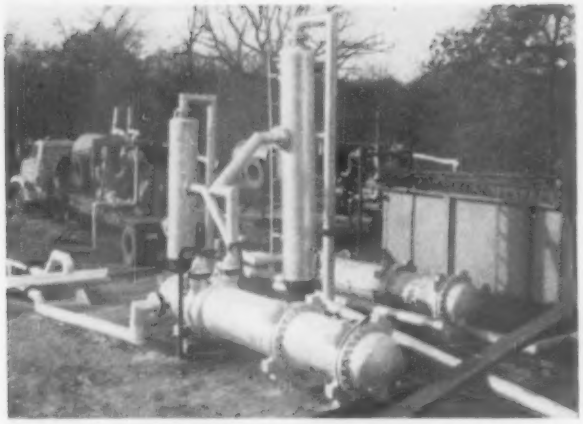


**TREATING EQUIPMENT** for exhaust gas includes a water-cooled heat exchanger and a moisture separator both upstream and downstream from the compressors. Heat-exchanger water is cooled by spray tank at right.

**FLOW LINE** discharges exhaust gas and cuttings which appear as a fine powder. Exhaust gas eliminates chance of down-hole explosions. Gas flare at discharge burns any formation gas produced, insuring against a rig fire.

*Reduced costs and better operation result from . . .*

# Drilling In With Exhaust Gas

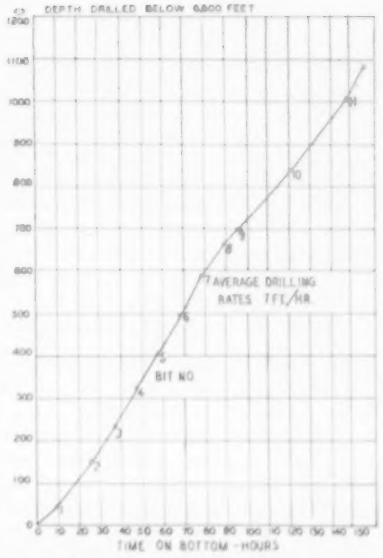
## *Tight, hard-rock pay formations have provided good conditions in which to test this type of circulating "fluid" in Oklahoma*

**by J. O. Scott**
District Editor

FRANKFORT OIL CO., drilling for Viola production in Lone Grove field of southern Oklahoma, has found a way to cut well drilling costs by a third. This is by using exhaust gases as the circulating fluid for drilling the Viola limestone. Drilling time in the Viola has been reduced about 25 days and the number of bits has been reduced by about 20. Total well time has been reduced from about 60 to 35 days.

As a doubly-safe means of penetrating the extremely hard, tight Viola, Frankfort has chosen exhaust gases for drilling rather than air. With oxygen excluded from the hole and flow line there is no chance of down-hole explosions and very little chance of catching the rig on fire. Exhaust gases perform the same as air in the actual drilling operation but require more treatment tophole to cool them to usable temperatures and to remove condensed water.

**Fast drilling . . .** Frankfort has successfully drilled with exhaust gas in three wells. Results were not too outstanding on the first because of trouble with an undergage hole which pinched new bits and caused poor performance.



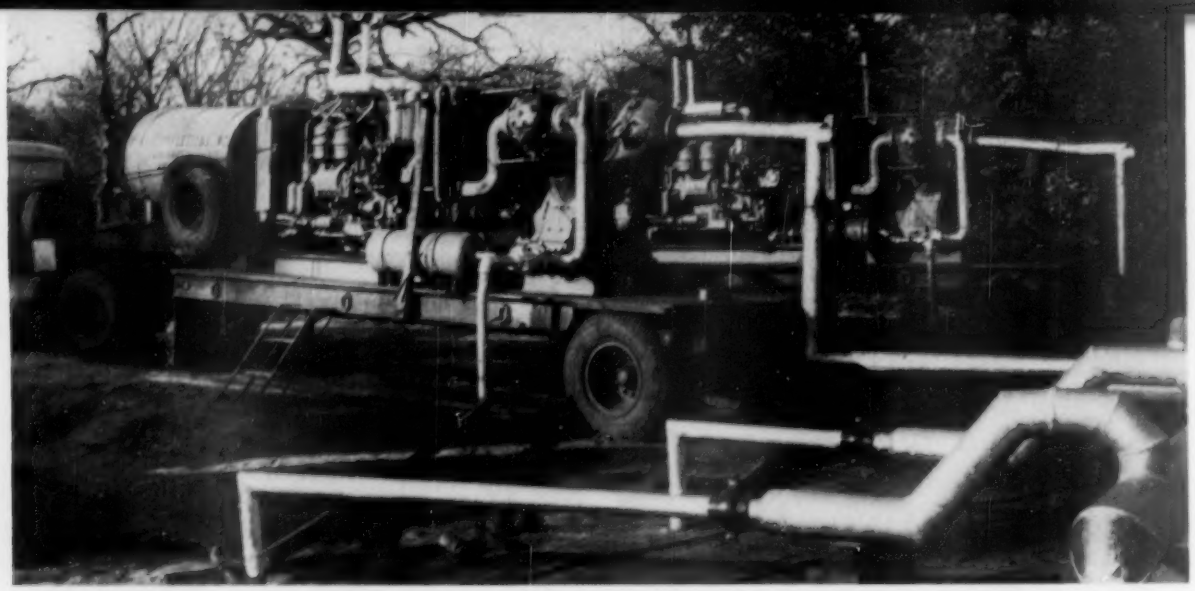

**DRILLING IN with exhaust gas speeds drilling time, saves bits. Gas drilling starts below casing (6,600 ft. in this well) set to exclude formation water. Hard, tight Viola limestone produces little fluid during drilling.**

However, in the second hole, and succeeding holes, this trouble has been circumvented and an excellent record has resulted. In 10 days of exhaust-gas drilling in the second hole, 1,085 ft. of hard Viola was drilled with 12 bits. In a similar well drilled with an inverted oil-emulsion mud, 35 days were re-

**TABLE I—BIT RECORD—FRANKFORT OIL CO. CENTRAL STANDARD NO. 1 WELL, VIOLA FORMATION 6,600 TO 7,685, CIRCULATING EXHAUST GASES**

| Bit No. | Depth (ft.) | Bit type | Bit footage | Hours per bit |
|---|---|---|---|---|
| 1 | 6,646 | 6¼-in. Hughes W7R | 46 | 10½ |
| 2 | 6,750 | 6¼-in. Hughes W7R | 104 | 16¾ |
| 3 | 6,836 | 6¼-in. Hughes W7R | 86 | 11 |
| 4 | 6,925 | 6¼-in. Hughes W7R | 89 | 10½ |
| 5 | 7,007 | 6¼-in. Hughes W7R | 82 | 10 |
| 6 | 7,096 | 6¼-in. Hughes W7R | 89 | 10½ |
| 7 | 7,190 | 6¼-in. Hughes W7R | 94 | 10 |
| 8 | 7,266 | 6¼-in. Hughes W7R | 76 | 10¾ |
| 9 | 7,299 | 6¼-in. Hughes W7R | 33 | 6½ |
| | | Average W7R | 78 | 10½ |
| 10 | 7,439 | 6¼-in. Hughes R-1 | 140 | 25 |
| 11 | 7,608 | 6¼-in. Hughes R-1 | 169 | 26¼ |
| 12 | 7,685 | 6¼-in. Hughes R-1 | 77 | 8 |
| | | Average R-1 | 129 | 20 |

Average drilling rate—7 ft. per hour.



**PISTON-TYPE COMPRESSORS provide high volume of gas at pressures up to 265 psi. For drilling a 6-in. hole, only one compressor is needed at a time.**

quired to drill 848 ft. of Viola and 35 bits were used. Normal drilling time with water-base muds is about 40 days with 25 to 40 bits.

**. . . Savings** on the second hole alone amount to almost $20,000. In addition, it is anticipated that the normal formation productivity will be unimpaired since gas alone has contacted the pay formation.

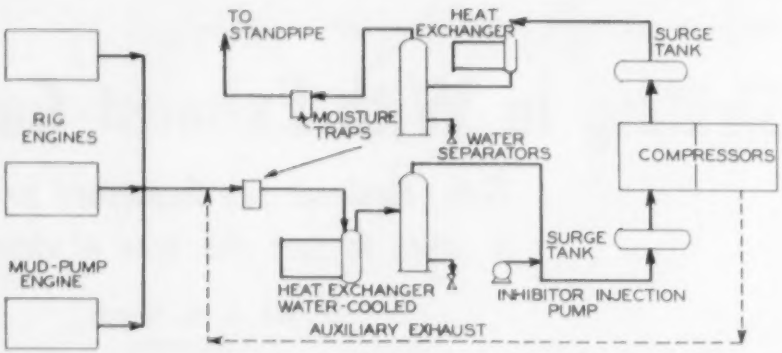
**Drilling conditions . . .** Digging in the Viola limestone of southern Oklahoma is tough. The formation is hard and abrasive and requires the toughest hard-rock toothed bits. Tungsten-carbide-insert bits are frequently used as well. But although the formation is hard, it is also tight. No water flows are encountered and this makes it ideal for gas drilling.

Uphole from the Viola, however, are many water-bearing formations. These would prevent gas drilling by wetting the cuttings which would cause them to ball up around the bit and pipe.

Because of these conditions, Frankfort drills down to the top of the Viola with mud and sets casing to seal off the water-bearing zones. This has been 7-in. casing. After casing is set, the cement is drilled out with water. The water is then swabbed out of the hole through the drill pipe while the well-head equipment, compressors, and exhaust-gas conditioning equipment is set up.

**Handling exhaust gas . . .** Blowout-control equipment has consisted of one preventer. A Shaffer drilling head is hooked up on top of the flow-line spool and preventer to prevent return gas and dust from blowing up around the drill pipe and kelly.

Since the hole is dry when the compressors are started up, there is no problem in establishing circulation and beginning to drill. Engine exhaust gas is cooled, run through separators to remove condensed water, then compressed, cooled, relieved of condensed water, and fed to the standpipe. The gas travels down the pipe, cools the bit, and lifts up cuttings from the bottom of the hole and ejects them in a powdery form at the end of the flow line. A flare is kept burning at the flow-line discharge to burn any gas or oil that is carried out by the gas.




**SURFACE HOOKUP takes exhaust from rig engines, cools it, separates moisture and compresses it for delivery to standpipe. Three engines provide sufficient exhaust for drilling 6-in. hole.**

**Making connections . . .** When the kelly is drilled down and a joint of pipe is to be connected to the drilling string, the valve from the standpipe to the casing head is opened which allows the gas from the compressors to bypass the hole. Then the standpipe valve is shut and a vent to the standpipe, hose, and kelly is opened to bleed off the pressure. The joint is made up, the vent closed, the standpipe again connected to the compressors, and drilling begins again.

For the drilling of the Viola, it has not been necessary to blow the cuttings out of the hole to make connections. Because the cuttings are fine and occupy only a small volume in the hole at any time, no trouble has been encountered with their settling down around the pipe during connections. The hole has been blown clean only prior to trips. Because of this, the time for making connections is hardly any longer than is required in mud drilling.

**Drilling practices . . .** The hole drilled out from under the 7-in. casing is 6¼-in. and a string of 2⅞-in. drill pipe is used. Hard-rock bits have been Hughes W7R and R-1. About 6,000 to 9,000 lb. of weight is carried on the bit.

Frankfort has had two positive-displacement compressors on hand for the drilling but has found that one is ample at any one time. Circulation rate with one compressor is about 750 cu. ft. per minute at a standpipe pressure of 150 to 190 psi. This provides a minimum annular velocity of slightly more than 3,000 ft. per minute which has proved adequate for hole cleaning and cuttings removal.

After the hole is drilled to total depth, it is left filled with gas for com-

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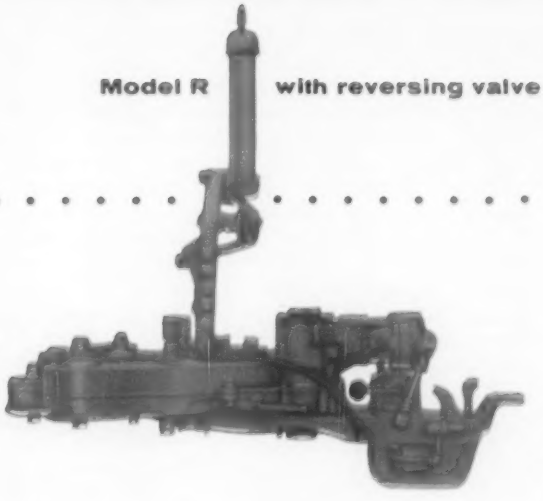

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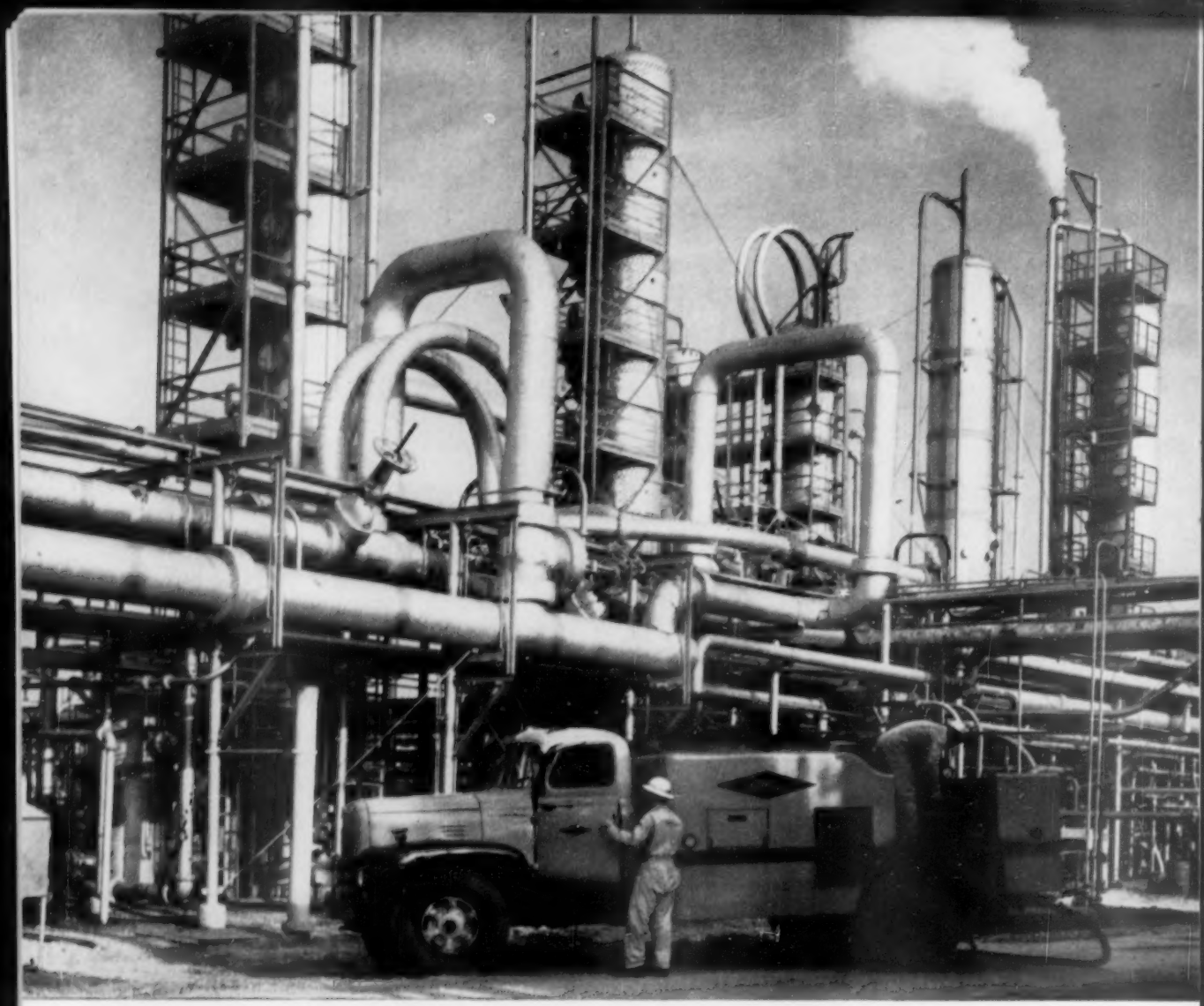

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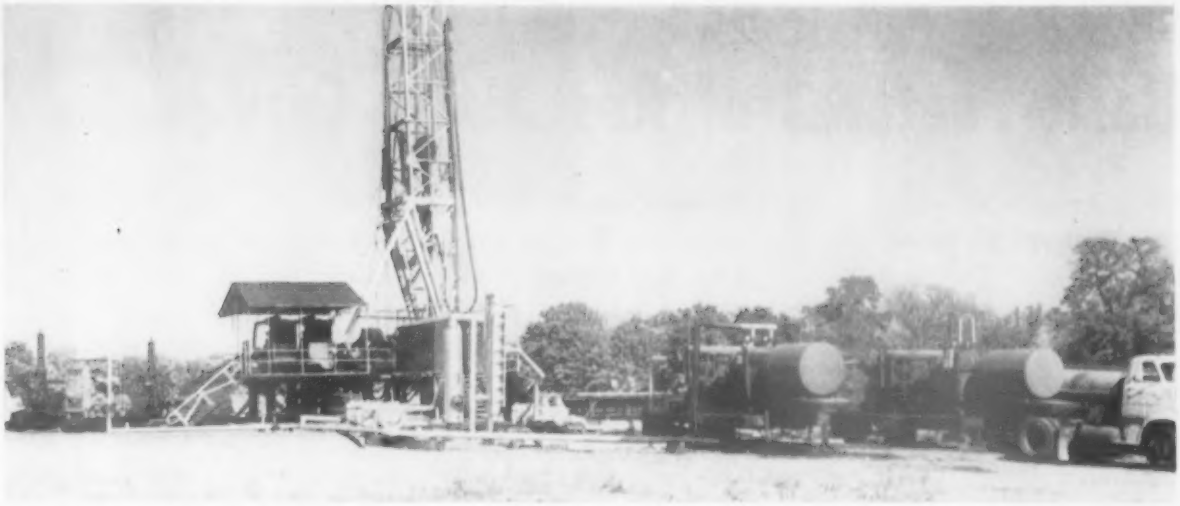


**THIS GAS-DRILLING SETUP saved Frankfort Oil Co. nearly $20,000 on this hole. Drilling time was cut about 25 days and use of exhaust gas minimized danger to rig and equipment.**

pletion. Because of the gas, conventional electric logs are of no value. To obtain formation resistivity, Frankfort runs an induction log. For lithology and porosity, the gamma ray-neutron logs are run.

**Completion . . .** A spinner survey is run to determine zones of permeability and open-hole hydraulic packers are used to straddle favorable zones for treating. The formation is very competent and there is little danger in the barefoot completion. Exhaust-gas drilling keeps the hole very close to bit gage and minimizes the chances of packer failure.

**Contracts . . .** On the three wells drilled, Frankfort has contracted the drilling and compressor services on a daily basis. Frankfort has provided the equipment necessary for treating the exhaust gas. On the first well, the 1 Thompson, the drilling contractor was Rogers Drilling Co. and on the second, the 1 Central Standard, Goff-Leeper, of Ardmore, Okla., did the drilling. The third well was the 2 Greenwood, drilled by Riceland Drilling Co. Well Completions, Inc., of Denver, has provided the positive-displacement compressors and technical service for exhaust-gas drilling.

**. . . Daily drilling costs** have been about $800 per day plus bits and the compressor service costs $175 per unit per day over a minimum time of 10 days. The exhaust-gas heat exchangers and separators were second-hand equipment and the installation cost about $20,000. However, this cost will be spread out over future wells as well as the ones already drilled. The equipment also is salvageable for other oil-field operations.

**Exhaust-gas problems . . .** Since exhaust gas drilling had been tested only once before in oil-field drilling,[1] Frankfort had to experiment some to find the best setup for treating the exhaust gases. Numerous bugs cropped up on the first two tests but these were mostly ironed out by the time the second hole was drilled.

On the first hole, trouble occurred when the exhaust from the diesel engines driving the compressors was mixed with the exhaust from the butane engines on the rig. This gas mixture contained a lot of carbon and caused severe corrosion and erosion, especially at pipe bends.

On the second hole, the diesel-engine exhaust was not used and all gases came from the two draw-works gas engines and the mud-pump gas engine. Much of the corrosion trouble cleared up. To minimize corrosion of the compressors, however, corrosion inhibitor and kerosine for lubricating the compressors are injected into the gas stream at the compressor inlet. The inhibitor is injected at a rate of about 1 pt. per day along with 3 gal. of kerosine daily.

**Treating system . . .** The accompanying flow diagram shows the setup of the exhaust-gas treating system used in drilling the 1 Central Standard. Exhaust gas leaves the three rig engines at an estimated temperature of 450° F. It is fed into a moisture trap, and then passes into a Braun heat exchanger through which cooling water is circulated. Although two water jackets just before the exchangers were used, they were not found to be very effective and are not being used in present installations.

Exhaust gas leaves the first heat exchanger at about 95° to 140° F. It then enters a water separator and is sucked into the compressors. This separator takes about 20 gal. of water per hour out of the gas.

The gas becomes heated in the compressors and must be again cooled before it passes to the standpipe. This second heat exchanger cools the gas to about the same temperature as the first. Following this exchanger, a high-pressure separator removes condensed water and a moisture trap further dehydrates the gas. The gas then flows into the standpipe and down the drill pipe.

**Piston-type compressors . . .** Input gas to the compressors is under a slight pressure. However, relief valves are provided for the engine exhausts if the pressure becomes too great. The compressors, provided by Well Completions, Inc., are two-stage double-acting piston-type compressors made by Joy Manufacturing Co. They are driven by 252-hp. diesel engines. Compressor bores are 13½ and 7 in. The compressors are capable of handling 750 cu. ft. of gas per minute with an output pressure of 265 psi. However, pressures of only 150 to 190 psi. were required on Frankfort's wells.

Each compressor package is mounted on its own trailer which also carries the diesel supply. The units are highly portable and gross weight with truck is only 38,000 lb. which means they need no special road permit.


### Acknowledgment

Credit is due Jack Sandridge of Frankfort Oil Co. and Ted Ranger, of Well Completions, Inc., who provided the information for this article.


### References


1. Erbe, Charles B., "Exhaust Gas Boosts Drilling Rate," The Oil and Gas Journal, February 12, 1955, p. 119.

ELECTRIC AND RADIOACTIVE LOGGING—3

# Basic Features of Resistivity Curves

**by Robert V. West, Jr.**

Previous articles in this series have described the operation and use of conventional electric-log curves—the S.P., the normal, and the lateral curves. This article further describes the lateral curve and auxiliary resistivity curves obtained by the limestone device and the Laterolog.* Proper use of these logs will greatly improve the accuracy of identifying and describing formations.

THE lateral curve, obtained with the three-electrode device described in the previous installment, has the long electrode spacing which permits deep investigation of formations. But this feature also complicates the shape of the lateral resistivity curves.

**Formation thickness . . .** Figs. 16a and 16b show the effects of formation thickness on the theoretical shapes and amplitudes of lateral curves. Fig. 16a shows the theoretical curve for a resistive formation of greater thickness than the AO spacing. This type curve has two important characteristics: (1) the apparent formation thickness is considerably less than the actual thickness, with the difference being equal to the AO spacing; (2) the apparent resistivity at the bottom boundary is greater than the true resistivity.

The curve is further characterized by a marked recession above the formation's top boundary followed by a gradual amplitude increase. This increase occurs as the MN portion of the device penetrates the formation. A rapid amplitude increase occurs as A enters the formation; a maximum is reached just before the MN portion passes the bottom boundary.

Fig. 16b shows the theoretical curve for a resistive formation of thickness less than the AO spacing. The curve is characterized by a slight recession above the upper formation boundary, followed by a gradual amplitude increase to a peak value just above the lower boundary. It is important to note that the apparent peak resistivity is considerably less than the true resistivity.

**Blind zone . . .** Below the peak, there is a slight recession corresponding to conditions when neither A, M, or N, are located within the formation boundaries. This is the so-called blind zone. Below the blind zone there is a second resistive peak of lower amplitude than that opposite the formation's lower boundary. This is the so-called reflection peak, whose occurrence corresponds to the passage of A through the formation's lower boundary.

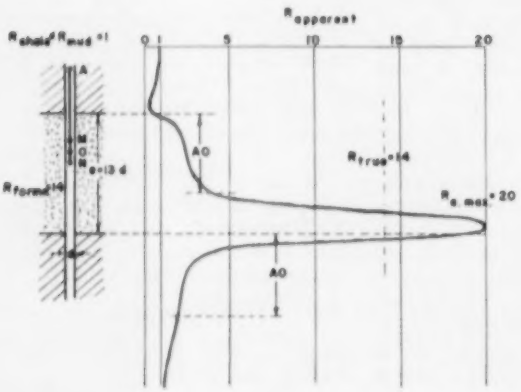
Fig. 17 illustrates the misleading effects of the blind-zone and reflection peak in a closely spaced sequence of thin resistive formations. For the two thin formations shown there are actually four resistive peaks. Two of these are reflection peaks that might be misinterpreted as actual resistive zones. In such cases the lateral curve must be interpreted concurrently with information from other resistivity curves and from the S.P. curve.

Figs. 18a and 18b show the effects of thickness of conductive formations on the shapes and amplitudes of lateral curves. Fig. 18a shows the conditions for a formation of thickness greater than the AO spacing, while Fig. 18b shows conditions for a formation of thickness less than the AO spacing. It should be pointed out that for the thick zone of Fig. 18a the apparent resistivity actually equals the true resistivity and that for the thin zone of Fig. 18b the apparent resistivity closely approaches the true resistivity. For the highly resistive zones of Figs. 16a and 16b the differences between apparent and true resistivities are substantial.

In dense formations such as limestones and dolomites, only porous and permeable zones can serve as petroleum reservoirs. Permeable zones in a dense formation are usually more conducive than the body of the formation because of the high salinities of their interstitial waters. This condition prevails **even if the permeable zones are saturated with hydrocarbons.** Thus in dense formations, resistivity logs are useful only to

*For simplicity, the nomenclature of Schlumberger Well Surveying Corp. is used. Other companies employ similar services under different names.

PRODUCING



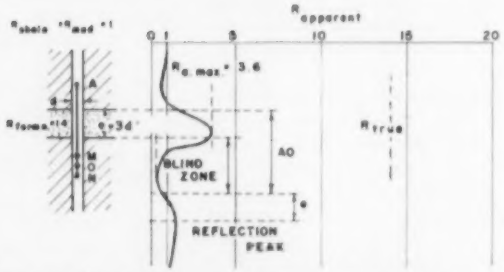
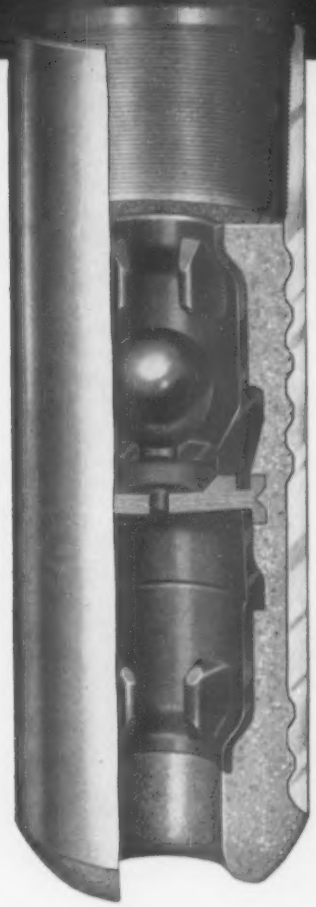




**Fig. 16a (left)—Relative position of lateral electrodes causes a delayed resistivity buildup and high reading at the bottom of a thick formation.**

**Fig. 16b (above)—Lateral curve resistivity will not reach true resistivity of a thin resistive zone. Repulsion of current causes blind zone and reflection peak.**

**AUTOMATIC, REGULATED FILL OF THE CASING AS IT IS BEING RUN**

***PROTECTION AGAINST DESTRUCTIVE HIGH-PRESSURE SURGES**



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# BAKER FLEXIFLOW

## FILL-UP SHOES AND COLLARS

Baker Flexiflow Fill-Up Equipment, a new companion line to Baker Differential Fill-Up Equipment is designed to be run in wells of moderate depth.

### FEATURES

#### SELF-ADJUSTING FLOW CONTROL DIAPHRAGM

Baker Flexiflow Fill-Up Equipment contains a variable valve (Self-Adjusting Flow Control Diaphragm) that automatically opens wider or closes down to provide MINIMUM BOTTOM-HOLE PRESSURE INCREASES and regulated fill of the casing.

#### POSITIVE BALL-TYPE BACK-PRESSURE VALVE FOR CEMENTING

A Ball-Type, Back-Pressure Valve for floating or cementing can be brought into action at any time by applying a pressure of approximately 700 psi to the casing. See Figs. 2 and 3 below.

#### COMPLETELY DRILLABLE

The internal parts of Flexiflow Fill-Up Shoes and Collars consist of readily drillable concrete, a small amount of Bakelite and synthetic rubber.

#### ECONOMICAL

Baker Flexiflow Fill-Up Equipment not only permits the casing to be run more rapidly with greatly reduced pressure increases or surges on the formations below the shoe, but in addition, by eliminating the surface-filling operation, saves an additional amount of rig time. When these advantages are considered, Flexiflow Equipment is much more economical to run than conventional floating equipment.

*Pressure surges over 5,000 psi can be created each time a joint of casing equipped with conventional floating equipment is lowered under certain slim hole clearances.

High-Pressure surges can fracture and weaken a formation sufficiently to cause lost circulation or the failure of a primary cement job.

These destructive, high-pressure surges can be reduced . . .

- by increasing the lowering time per joint
- by increasing the casing clearance

or

- by running Baker Flexiflow (or Differential) Fill-Up Shoes and Collars

**NOTE:**

*Baker Fill-Up Equipment contains a variable valve that automatically opens up and adjusts to maintain minimum bottom-hole pressure as the casing is being run.*

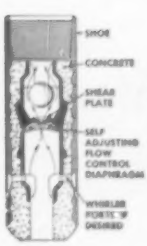


FIG. 1 Casing Filling while going in the hole

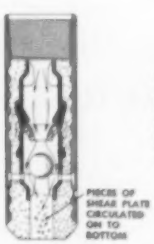


FIG. 2 Ball pumped through diaphragm

FIG. 3 Ball shut-off against cement back-pressure

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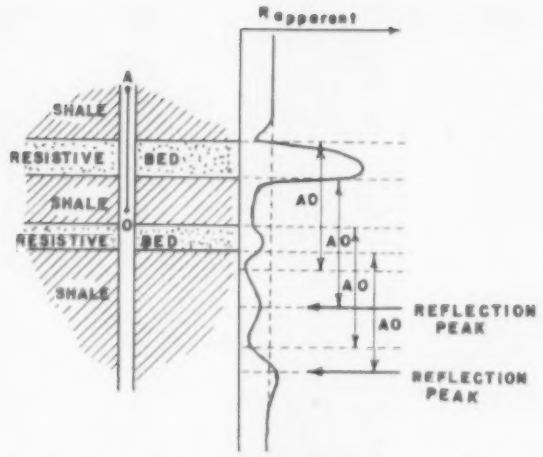



Fig. 17 (above)—Blind zone of lateral beneath thin resistive beds causes distortion of resistivities of beds in series.

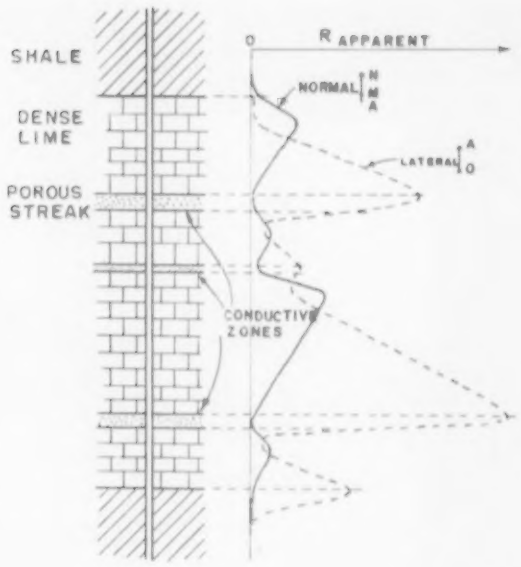



Fig. 19 (right)—Lack of symmetry of normal and lateral curves complicates the finding of porous zones in dense, tight formations.

differentiate between porous and nonporous zones. Distinction between oil and water-bearing zones is impossible.

### Resistivity Curves: Limestone Device

Ordinary resistivity-logging techniques are not as accurate for dense formations as for moderately resistive formations. In dense formations, the electric-current lines fail to penetrate the highly resistive rocks, but instead concentrate within the bore hole. Mud resistivity, bore-hole size, and location of the electrodes with respect to the formation boundaries then become the primary factors controlling the shape and amplitude of a resistivity curve.

The normal curve for a thick, dense zone is not symmetrical about the center of the zone but has a peak slightly below the zone's upper boundary. In thick, dense formations, both the normal and lateral curves exhibit dissymmetrical peaks for impermeable zones and dissymmetrical recessions for conductive zones.

Fig. 19 illustrates this condition and shows that the lateral recessions are shifted downward with respect to the conductive zones. Lack of symmetry of the resistivity curves in dense formations is their chief disadvantage because the location of porous zones is difficult. The so-called "limestone device" was developed to overcome this difficulty by yielding symmetrical resistivity curves in dense formations.

The electrode arrangement of the limestone device is shown in Fig. 20. The arrangement is equivalent to a symmetrical combination of two three-electrode systems. These may be either normal or lateral in character, depending on relative distances MM' and MN'.

A theoretical limestone curve for a thick, dense formation with a conductive zone is shown in Fig. 21. The important features of the curve are its symmetrical characteristics and the recession at the conductive or permeable zone. The utility of limestone curves for locating porous zones in dense formations has been partially superseded by the development of the MicroLog. MicroLog characteristics will be described in a later section.

### Resistivity Curves: Laterolog

For thin resistive zones, ordinary resistivity curves are so depressed in amplitude that the indicated resistivities differ markedly from the true values. This condition is accentuated when highly saline drilling muds are used.

Where several thin zones are close together and separated only by shale streaks, a conventional resistivity curve for the group exhibits one large rounded nose and fails to identify separately the individual thin zones. Hence the characteristics of the separate zones cannot even be estimated.

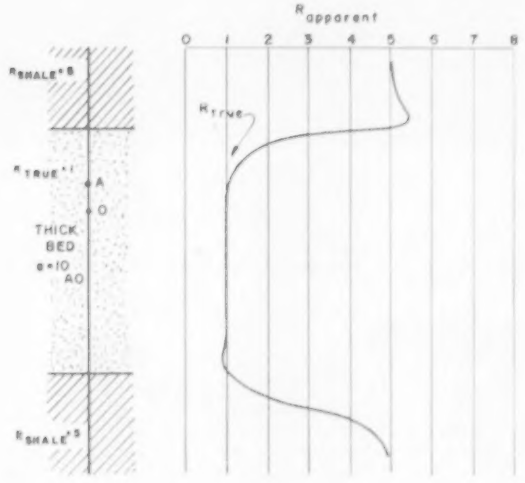
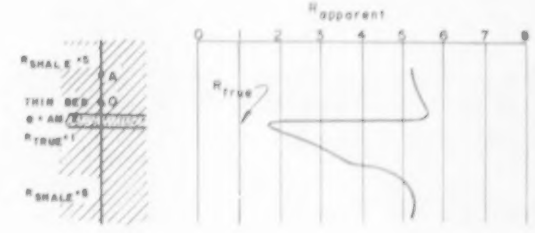



Fig. 18a (left)—Lateral-curve resistivity is true resistivity in thick conductive formations. The transition distance for recorded resistivity to change from high to low is equal to the electrode spacing.

Fig. 18b (below)—Lateral resistivity closely approaches true resistivity of thin conductive beds. Note that the shape of curve going from conductive bed to shale is similar to that shown in Figs. 16a and 16b.



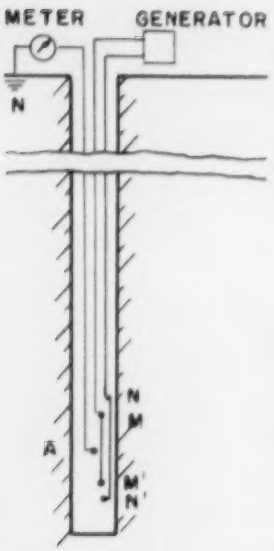



Fig. 20—Electrode arrangement for limestone device.

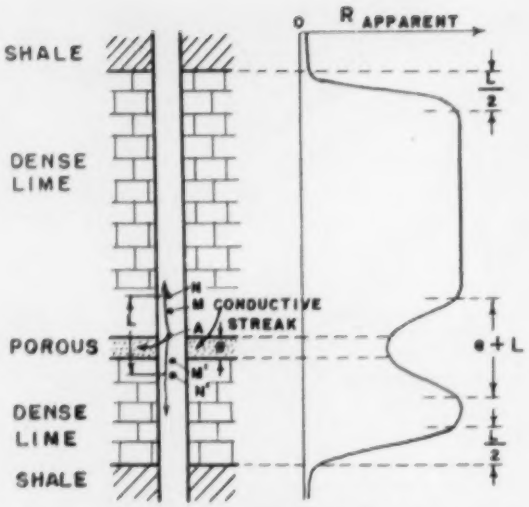



Fig. 21—Limestone device yields symmetrical curve for conductive bed surrounded by dense, tight formations. Compare this curve to the unsymmetrical curves of the normal and lateral shown in Fig. 19. MicroLog has partially superseded limestone device for locating permeable zones.

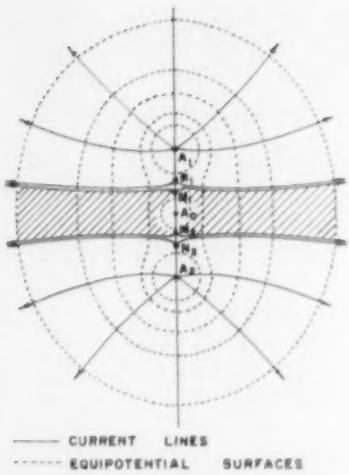



Fig. 22—Laterolog has electrode arrangement which causes a focusing of current into the adjacent formations. Low resistivity muds aid the Laterolog. Electrode spacing is short for logging thin beds.

To overcome this situation, a resistivity-logging technique has been developed to identify thin zones. The curve recorded by this method is called a Laterolog. The method employs a device for laterally focusing the current from a power electrode outwardly in a horizontal plane. Thus the current from the power electrode is directed into thin formations as a sheet of electricity, and current losses to the mud column and to adjacent zones are minimized.

The electrode arrangement for this method is shown in Fig. 22. There, $A_0$ is the primary power electrode through which is fed a constant electric current. Electrodes $M_1$, $N_1$, $M_2$, and $N_2$ are measuring electrodes, and $A_1$ and $A_2$ are auxiliary power electrodes. Electric currents from $A_1$ and $A_2$ are automatically adjusted to maintain zero voltage differential between $M_1M_2$ and $N_1N_2$ respectively. The voltage at any of these measuring electrodes is recorded, and apparent resistivities measured by the device are proportional to this voltage.

With this arrangement, the current from the primary power electrode $A_0$ is shielded from vertical travel up or down the mud column. Instead, it is directly focused into the formation.

Fig. 23 illustrates this situation and compares the current lines from a focused device with those from a non-focused device. It is apparent that focusing minimizes current losses to the mud column and to adjacent formations, and thus renders resistivity measurement more accurate.

Fig. 24 compares the resistivity curve for a thin formation using a focused device with the curves using normal and lateral devices. The focused curve is much more definite than the normal or lateral, and its peak more closely approaches the formation's true resistivity than do the peaks of the other curves.

## BEHIND . . . AND AHEAD

**Installment 1** of this series appeared on page 268 of the January 30, 1956, issue. The second installment was presented on page 89 of the February 6 issue.

**Installment 4** will deal with the MicroLog and Microlaterolog, and will explain how these devices make a detailed examination of the well bore. It will also describe the techniques of quantitative analysis used to interpret the data these devices yield.

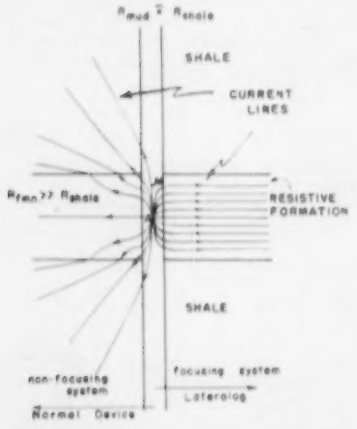



Fig. 23—Focusing of current by Laterolog makes resistivity measurements more accurate than those of the normal device.

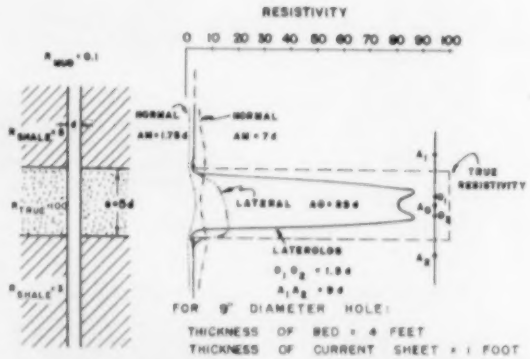



Fig. 24—Laterolog resistivity is much closer to true resistivity of a thin resistive bed than normal or lateral curves. Readings are very accurate so long as the spacing $O_1O_2$ is less than bed thickness.

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## *McCullough Log Saves $40.00 Per Foot Coring Cost in Offset Well*

This was well #2 of a drilling program, an offset to the first well in the area which was cored completely. Depth of operation was below 5,000 feet. 5½" O.D. 15 lb. casing had been cemented through the pay zone.

A McCullough Radiation Well Log was run obtaining Gamma Ray and Neutron curves and a simultaneous collar log. McCullough's Logging Engineer computed porosities from the Neutron Log, applied shale and thin bed corrections and located the 18 foot oil zone to be perforated between 5,050 and 5,068 feet. The porosity graphs and slope of the curves were determined from cores from the key well.

108 improved ½" Ogival Bullets were fired in the pay zone, six per foot, by 4¼" O.D. McCullough M-3 Bullet Perforators. Result: A good well, and it took only four hours to complete the logging and perforating.

Other offset wells in the field will be completed in the same way, saving $40.00 per foot in coring costs through the zones that would ordinarily be cored.

This is another fine example of the accuracy and reliability of the McCullough Radiation Well Logger, and its outstanding value as a correlative instrument.

# McCullough Log Helps Turn Water Well Into Oil Well

## *McCullough Radiation Well Logger Accurately Locates 3½ Foot Oil Zone Missed by Previous Log.*

While this was a wildcat well, the producing horizon had the same general characteristics as other wells in the basin; the usual gas cap, a very thin oil zone and a transitional zone. It was a typical tough completion problem calling for exact, detailed logging information and "pin point" accuracy in perforating.

First logged and perforated by another service company, the well flowed water. Depth of operation was below 5,500 feet and 5½" O.D. 14.5 lb. casing had been set through the producing horizon.

After squeezing to shut off the water flow, the operator called McCullough. A McCullough Radiation Well Log was run obtaining Gamma Ray and Neutron curves and recording a simultaneous collar log.

The McCullough Radiation Well Logger is the most accurate, reliable and efficient logging instrument available. It has greater stability, provides more detail and assures more accurate quantitative interpretation. You can be sure of exactly locating, defining and interpreting potentially productive formations—thick or thin.

It was found that the previous log had been ten feet deep on casing collars, formation tops and total depth measurements. In addition the log had been interpreted so that the oil zone was shown to be 30 feet into the transitional zone.

The McCullough Log accurately identified and exactly located the gas cap, a 3½ foot oil zone, then the transitional zone. The gas cap contact was perforated for a squeeze shut-off and the 3½ foot oil zone was perforated by ten McCullough Super Formation Glass Jets. The well was then fractured and is now a good, commercial, water free oil well. Total logging and perforating time was only three hours.

There are many actual jobs such as this where the accurate, reliable, easily interpreted information provided by the McCullough Radiation Well Logger has turned a total loss into a profitable operation.

For best results, always call for the McCullough Radiation Well Logger. The most dependable logging equipment available.

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ALL CRUDE OIL TREATING and power-oil cleanup are carried out at these centralized facilities. Net oil production automatically moves to a nearby shipping tankage.

# Centralized Treating Plant Pays Off

## *New facilities improve operating conditions, reduce upkeep costs*

**by D. H. Stormont**
District Editor

CENTRALIZED treating facilities and new electrical sediment separators for cleaning power oil used in hydraulic pumping are enabling Shell Oil Co. to realize worth-while operating economies at its Ten Section field.

The new facilities have improved operating conditions and reduced maintenance costs. Accuracy of production records has been improved. Over-all result is virtual automation of the gathering and treating processes.

**What's been changed . . .** Until the new unit was installed, the field's 130 producing wells were served by 12 trap farms. Each setting included separators and meters for 6 to 16 wells, wash tanks, chemical treating facilities, and test and stock tanks. A settling tank also was provided for the power oil supplied to hydraulic-pumped wells served by the farm.

Individual separators still are used at each tank farm but the wells now pump directly to the centralized dehydration plant. Only test tanks remain at the farms. Production data on individual wells are obtained by periodic switching from the production to the test manifold. New meter samplers automatically register the well's fluid output and provide a composite sample from which the percentage water cut is determined.

Production from the 12 trap farms, where pressures of 110 psi. are held on the single-stage traps, flows to one of four horizontal, indirect-fired emulsion treaters. Kern County Land Co. is the sole fee owner, but two leases are involved. Accordingly, three treaters handle the output of the large central "A" lease and the fourth that of the surrounding "B" lease.

**Treater operation . . .** Total fluid handled by the treaters is about 28,700 bbl. daily. This consists of some 4,200 bbl. daily of 35°-gravity net oil production, about 3,500 bbl. of water, and 21,000 bbl. of exhausted power oil. Approximately 6,500 bbl. is handled by the single unit serving lease "B." The remainder is fed equally to the other three treaters. Pressure regulators on the inlet side of the treaters hold a back pressure of 25 psi. on the incoming fluid.

Performance of the heater-treaters during their first 6 months' operation (from November 1954 to April 1955) is shown in the accompanying table.

Hot crude from the dehydrators either goes direct to nearby storage and shipping tanks or is diverted to the electrical sediment separators as power oil. The amount going to storage—net field production—is automatically controlled by back-pressure regulators and high-level throttling valves in the two power-oil surge tanks.

| | Lease "A" (3 heaters) | Lease "B" |
|---|---|---|
| Ambient air temp., °F. | 50 | 50 |
| Inlet temp., °F. | 71 | 66 |
| Gross fluid inlet, bbl. daily each | 7,400 | 6,200 |
| Outlet temp., °F. | 110-112 | 110-112 |
| Approx. inlet cut, per cent | 10 | 10 |
| Outlet cut, per cent | 0.5-0.8 | 0.1 |
| Chemical used, qt. per day each | 11.5 | 11.5 |

**Electrical sedimentation . . .** Four of the 10-ft.-diameter, 16-ft.-high separators handle "A" power oil and the other that for lease "B." Power supply for these units is a 440-volt, 60-cycle alternating current, stepped up through a high-voltage transformer and converted to direct current by a thyration rectifier circuit. Influence of the applied electric field causes the small amounts of dispersed water and suspended solids to settle out, resulting in much cleaner power oil than was being obtained by the settling-tank method formerly used.

A 3,750-bbl. surge tank is provided for lease "A" power oil and a 1,500-bbl. tank for the smaller lease. Engine-driven centrifugal pumps take suction from these tanks and discharge the power oil at 50 psi. for return to the trap farms. There, batteries of triplex pumps supply the power oil to the 106 wells equipped with Kobe hydraulic pumps.

**Economies realized . . .** The modernized

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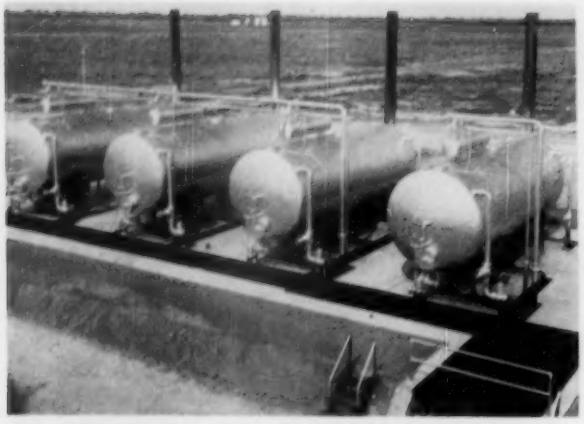
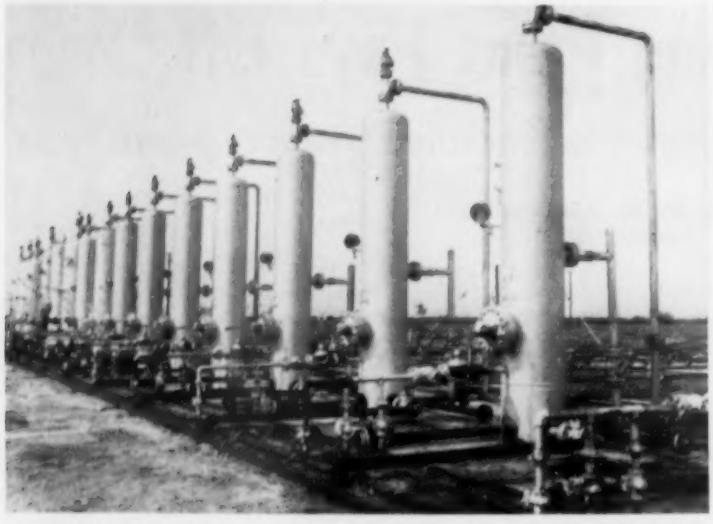
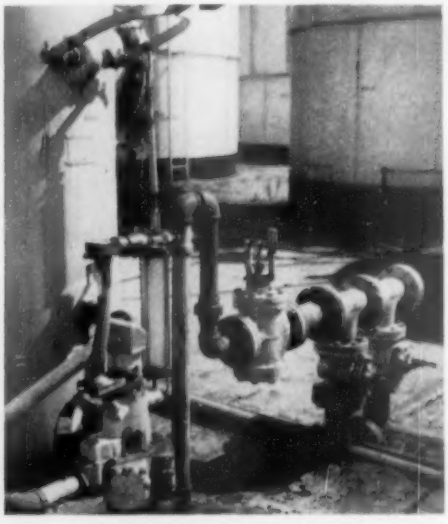


**HUGE HORIZONTAL emulsion treaters have reduced treating costs, improved treating. Each treater handles from 6,200 to 7,400 bbl. of produced fluid daily, including a 10 per cent water cut.**

**TREATED CRUDE OIL from dehydrators is automatically run to these electrical sediment separators in response to needs of the 106 wells equipped with hydraulic pumps.**



**BATTERY OF TRAPS at one of the 12 trap farms in Ten Section field. Except when the wells are on test, they now pump directly to the centralized dehydration plant.**



**NEW METER-SAMPLERS at each of the 12 trap farms automatically meter a well's output while it is on test.**

Ten Section facilities have not been in operation long enough for Shell's engineers to accurately appraise the benefits being realized. It is anticipated, however, that the savings will afford an excellent payout.

Insofar as the tank farms are concerned, the new treaters permitted the removal of seven 1,500-bbl., three 750-bbl., and one each 3,000 and 1,000-bbl. wash tanks. In addition the power-oil settling tanks and most storage tanks at each farm have been dismantled. The reduction in tankage, and elimination of maintenance costs, will make for substantial savings.

The heater-treaters also have cut treating costs. Chemical consumption has been lowered by 30 per cent. Treating temperatures have been reduced 10° F. Better utilization of heat, plus the lowered treating temperature, has resulted in a big drop in fuel-gas consumption.

**Pump life increased . . .** Savings being realized from the electrical sediment separators have not been evaluated, but there has been a noticeable drop in the frequency of pump pulling jobs.

An idea of the savings in pump-repair and well-pulling costs which may result from use of the separators can be gained from tests carried out in 1953. According to R. E. Phelan,* average life of the hydraulic pumps was about 6 months when settling tanks were being used. Based on the performance of 13 wells during a 4-month test period, the cleaner power oil supplied by the electrical precipitator will result in a pump life of 24 months.

In these tests the separator supplied 4,000 bbl. of power oil daily to 13 wells. Average water cut of the inlet crude, after being treated in a wash tank, was 1.22 per cent. The sediment separator reduced this cut to 0.04 per cent. The solids content was reduced by 75 per cent, from 8.7 p.p.m. to 2.2 p.p.m.

**Water disposal . . .** While the gathering and treating facilities were being revamped, new salt-water-disposal facilities also were added at the central dehydration plant. Water removed in the treaters and separators is collected in a 1,000-bbl. surge tank. Following treatment and filtration, the field's 3,500-bbl.-daily water output is pumped to a north-flank injection well.

*"Improved Hydraulic Rodless Pump Performance Through Use of Electrical Sediment Separator," R. E. Phelan, fall meeting A.I.M.E. Petroleum Branch, Los Angeles, October 1-2, 1953.

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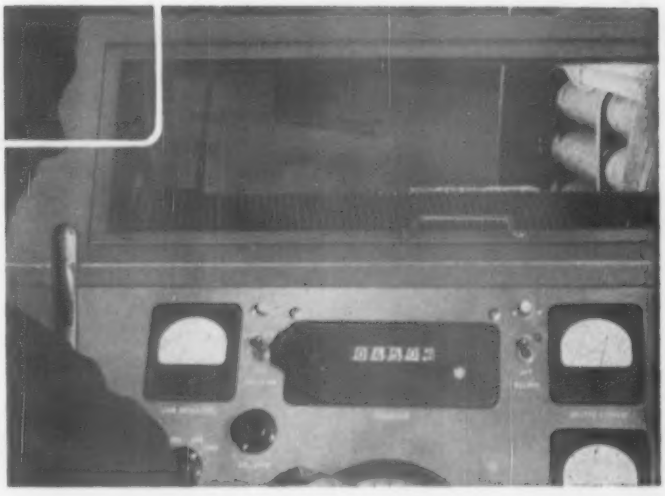

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## Here's how to maintain a safer drilling rig

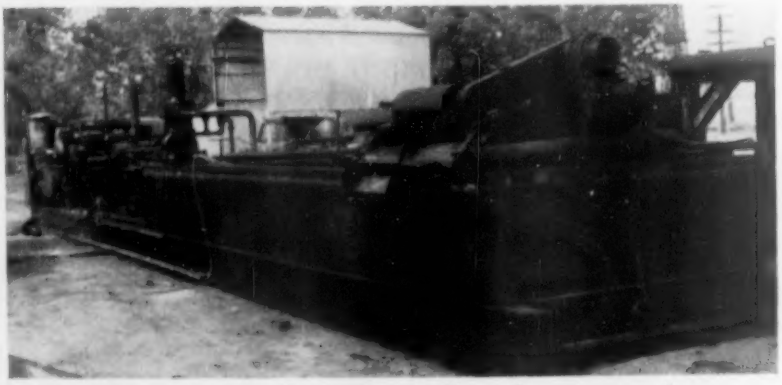
GOOD housekeeping around a drilling well promotes safety and efficiency. On this well, walkways are outlined with old drill bits and the entire area around the well is kept clear of junk. Ladders are clean and caution signs are prominent. Soft-drink bottles are dangerous when stepped on; a cut-down oil drum, lower center of picture, catches these items and waste paper. Drilling crews and visitors to the rig wear safety hats. Properly hanging the catline and keeping the rig floor clear and clean around the cathead are prime safety requirements around any drilling well. Life of the line is also extended. At right, a driller for Parker Drilling Co. shows a good method of storing the catline after use. This Parker rig is operating in Carter County, Oklahoma.

## This pot on the meter run prevents hydrate formation

WHEN R. H. Abercrombie Co. of Houston had trouble getting its gas into the gathering line last winter, the pumper and welder made a homemade pot to lubricate the antihydrate chemicals into the gas line. The pot is made from a section of 6-in. pipe, orange-peel-welded shut on each end, with a saddle fastened to the bottom to bolt around the meter run. On the side of the top, a 2-in. collar and bull plug are welded to provide a means of filling.

Two ¼-in. connections are made in the vessel, one near the bottom and the other near the top. They are tied together with ¼-in. pipe, and a connection then runs into the top of the meter run.

In operation, the vessel is filled with chemical through the top opening, and the ¼-in. needle valve on the bypass to the top is opened wide. The needle valve on the side of the vessel is then cracked just enough to allow the contents to drip into the line at an hourly rate that is determined by watching the inspection glass.



## Unitizing a mud system for fast moving

GENERAL PRODUCTION SERVICE, of Bakersfield, Calif., has unitized the mud system on one of its servicing units operating in the San Joaquin Valley. The pump is chain driven by a 200-hp. diesel, and both

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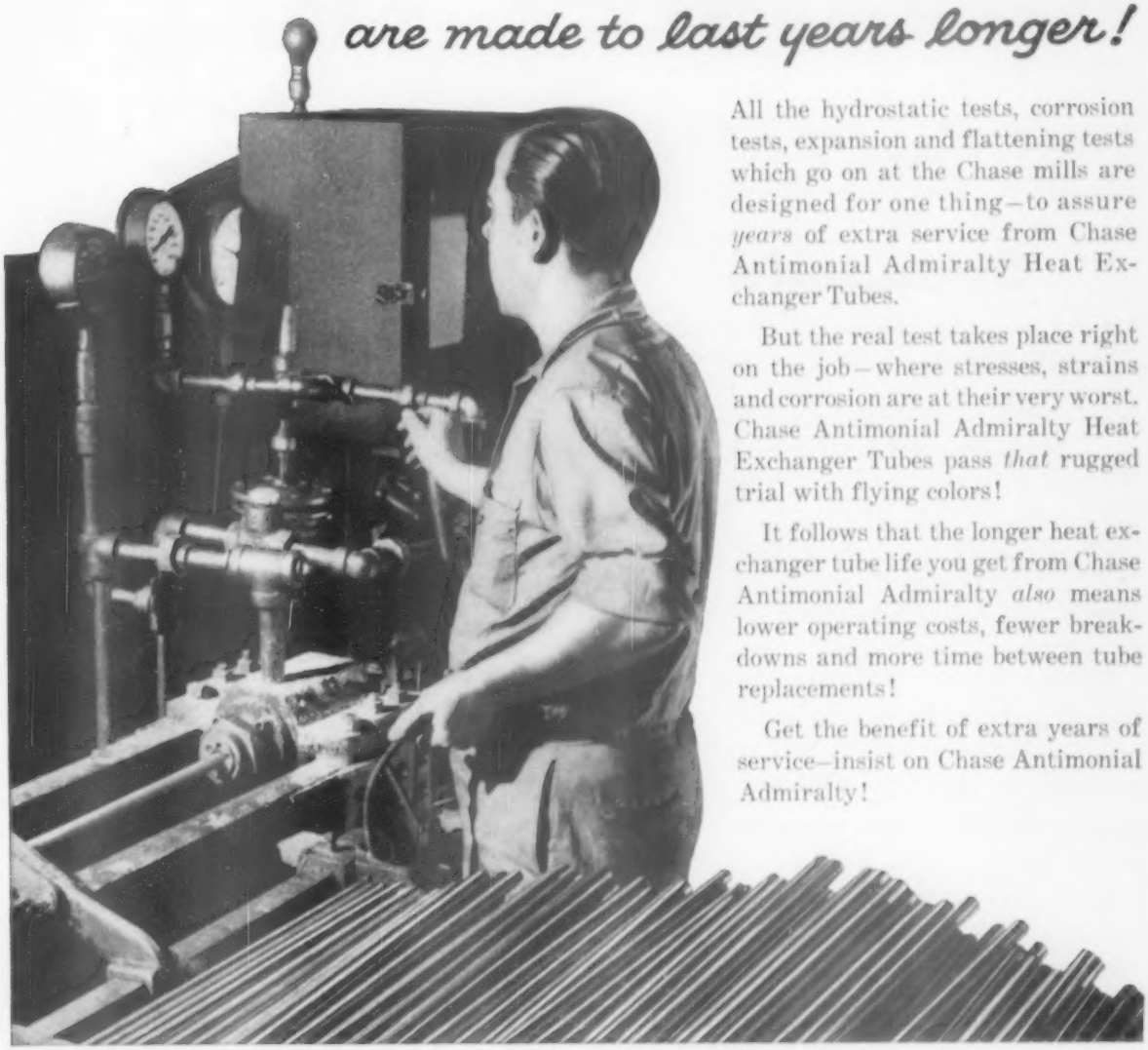

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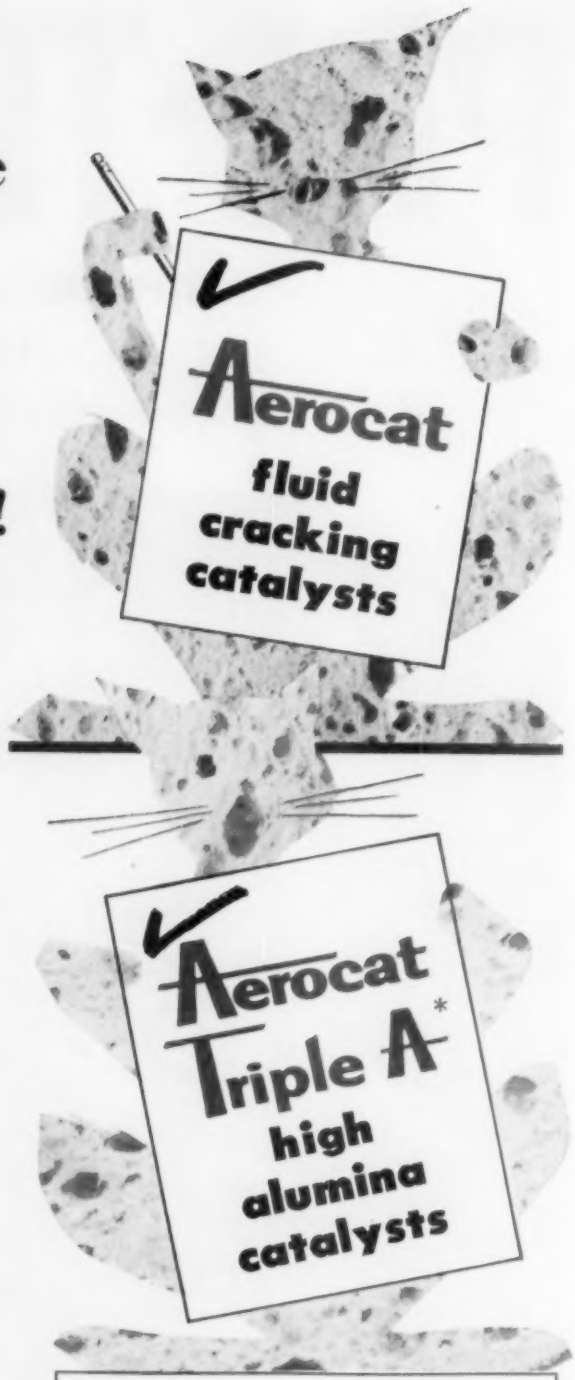


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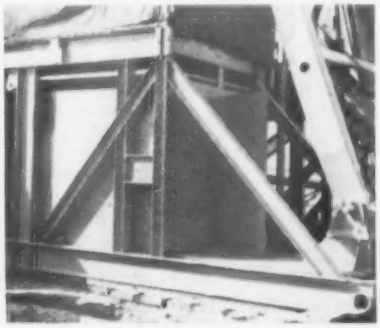
are combined with a 90-bbl. mud tank into a 7⅜-ft. by 52-ft. package weighing 24 tons. While the package's weight is a disadvantage, it has been found to be more than offset by the ease with which it can be moved and installed.

## Compartment in substructure provides handy storage

THIS tool compartment for the storage of hand tools, kelly bushings, etc., has been built into the substructure of Kirkpatrick Oil Co.'s Rig No. 4 which is drilling in Carter County, Oklahoma. Besides the door on the side, ac-



cess to the compartment may be had through a trap door in the derrick floor, so that the bushings and other heavy articles may be lowered on the cat line.

## Old oil-field boilers help supply steam to cycling plant

THREE oil-field-type boilers are giving effective service both in supplementing the regular steam supply and in providing a standby steam supply at Trinity Gas Corp.'s cycling plant in Sejite field, South Texas.

The plant uses two regular boilers, installed when the plant was constructed, as its main source of steam. However, plant requirements increased making it necessary to have an additional source. One of the oil-field-type boilers was found to be sufficient to provide supplementary service under normal conditions.

The three oil-field units provide the plant with a safety factor for in case of an emergency, or overhaul, one of the main boilers combined with the three is sufficient to handle normal plant requirements. Output of all the boilers goes into a header from which steam requirements for the plant are obtained, thereby making it possible to use any individual boiler or combination as required.

## Wheel-mounting speeds light mast moving

IN Pennsylvania, one well-servicing contractor mounts wheels on his light masts. These rigs are very handy for bailing and swabbing operations where they are needed for only a few hours at a time on a location and must be continually moved back and forth.

The lower end of the rig is equipped with a removable trailer hitch of angle iron. Wheel and axle are from an old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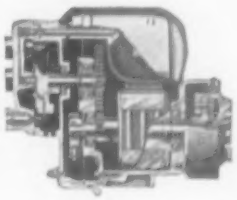

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car and are attached to the mast by welded 2-in. pipe.

When the rig is spotted on location, the trailer hitch is removed, the wooden base is lowered to the ground, and the mast is raised with the wheels attached.

## Here's an easy way to reduce flow-line corrosion

WHERE produced fluids are corrosive, it is good practice to protect the flow line and surface connections with an inhibitor. This simple pot on the tubing head of this pumping well serves as a convenient and effective method of injecting inhibitor.

The pot, made from line pipe, is connected to the tee joining the tubing and flow line just below the stuffing box. The valve on the pot is normally regulated to let inhibitor trickle into the produced oil stream over a period of time.

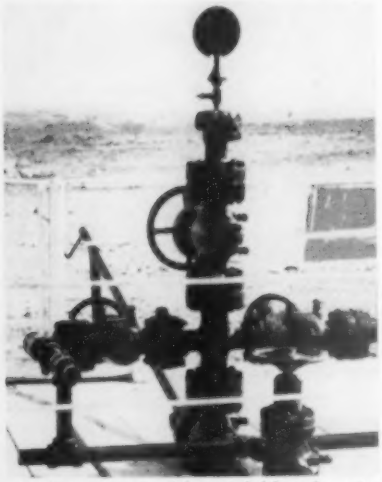
When the well has not been pumped for awhile, the pumper fills the pot

with about a gallon of inhibitor just before starting the pump. This is allowed to leak back down the well so that the top of the tubing and rods become protected against corrosion. As the well pumps fluid up, the inhibitor is carried out and down the flow line for further protection.

## Long crank gives pumper easier, safer control

A LONG crank of the wellhead valve in place of the hand wheel allows the pumper on this lease to open or shut in the well without going inside the guard fence. By remaining back away from the wellhead, the pumper has a good view of the pressure gages, while turning the valve. He is also out of the way should high gas pressure cause failure of some of the wellhead equipment when he opens the well.

The crank rides inside of a length



of pipe supported by a rigid stake outside the fence. It fits to the stem of the valve by a swivel joint which allows easy turning of the valve.

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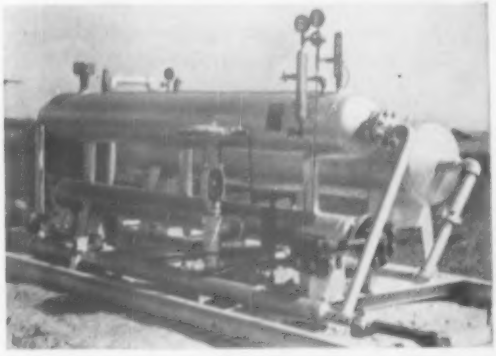

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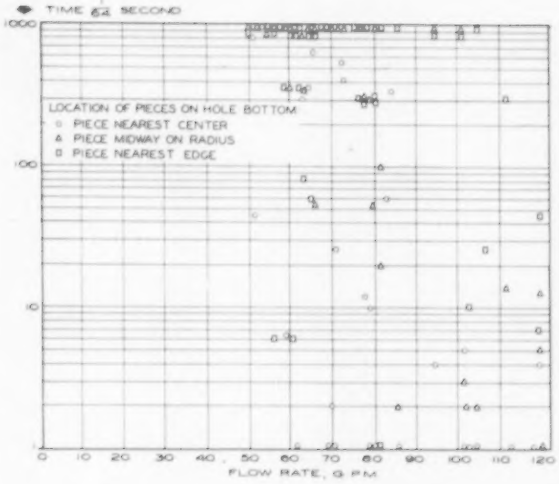
## Battelle research shows that to . . .

# Drill Faster and Deeper

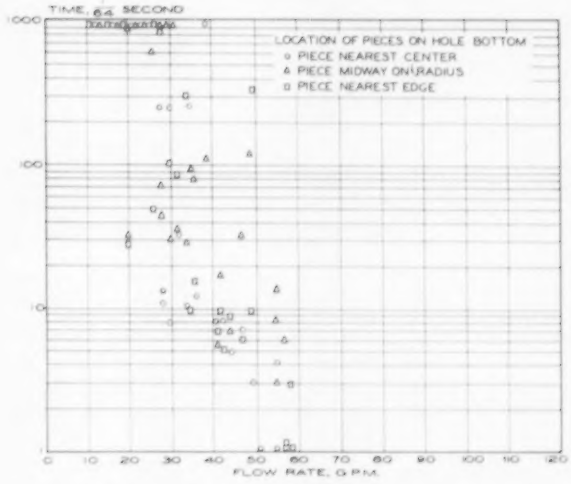
***. . . Bottom of hole must be kept clean of cuttings and fluid stream must be directed toward lines of contact of cutters and rock***




**CHIP - CLEARANCE time vs. flow rate for a standard bit in bentonite mud. Fig. 1.**

**Bit—Standard tricone, 1 $\frac{7}{8}$-in. opening.**

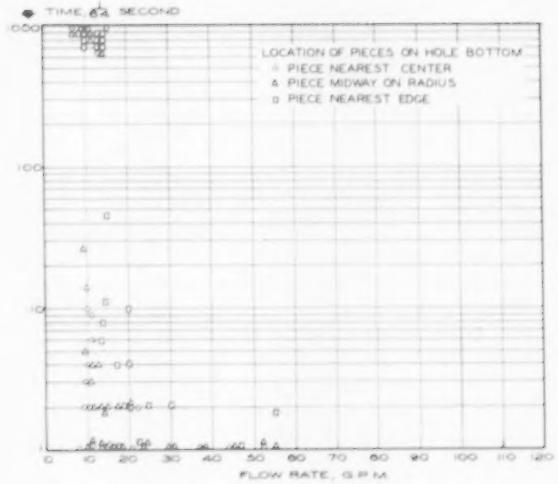
**Fluid—Bentonite mud, 8.7 lb./gal.; viscosity 90 cp. Stormer at 600 r.p.m.; water loss 8 cc. A.P.I. test; load on Stormer to break 10-minute gel, 375 g.**




**CHIP - CLEARANCE time vs. flow rate for a jet bit in bentonite mud. Fig. 2.**

**Bit—Jet, two rollers with two ½-in. openings**

**Fluid—Bentonite mud, 8.7 lb./gal.; viscosity 90 cp. Stormer at 600 r.p.m.; water loss 8 cc. A.P.I. test; load on Stormer to break 10-minute gel, 375 g.**




**CHIP - CLEARANCE time vs. flow rate for the modified jet bit in bentonite mud. Fig. 3.**

**Bit—Jet, two rollers with two ½-in. openings and director tubes.**

**Fluid—Bentonite mud, 8.7 lb./gal.; viscosity 90 cp. Stormer at 600 r.p.m., 77° F.; filtration rate 8 cc. A.P.I. test; load on Stormer to break 10-minute gel, 375 g.**

AN 18-month program of fundamental research to determine the effects of drilling fluid on the penetration of rock bits was recently completed by Battelle Memorial Institute, Columbus, Ohio, for the American Association of Oilwell Drilling Contractors.

Basically, Battelle's findings indicate that to drill faster and deeper it is necessary to keep the bottom of the hole clear of cuttings so that the bit can have an unobstructed area to get its teeth into. Also, the presence of certain electrolytes in the drilling mud aid in making the rock "softer" to drill.

The experiments revealed two main conclusions with regard to drilling fluids and design of rock bits.

1. Clearing the chips quickly from the bottom of the hole—a function of drilling fluids—speeds the rate of penetration by giving the drill bit an unobstructed path. To improve the penetration rate when drilling with mud **the ratio of effective viscosity to density** (kinematic viscosity) **should be kept as low** as possible, consistent with other requirements of the mud.

Much of the Battelle work on drilling fluids was directed toward the behavior of mud and cuttings at the bottom of the hole, rather than in the annular space. Other researchers have previously done a large amount of work to find the relationships between the fluid properties and the velocity of the chips carried upward in the space between the drill string and the wall of the hole.

Comparative experiments indicated that the dynamic viscosity coefficient is the most important physical property of drilling mud with respect to chip clearance. Gel strength and density are of less consequence and filtration rate has no measurable effect.

*This is an abridged version of the report submitted to the American Association of Oilwell Drilling Contractors. The original report was written by Donald Gideon, Ralph Simon, and Horace Grover, Battelle Memorial Institute, Columbus, Ohio.

## "Hardness reducers may increase penetration rate."

2. The second important conclusion is that the relationship between chip-clearance time and volume rate of flow is also found to depend upon the hydraulic system of the bit. Battelle's studies indicate that penetration rate can be accelerated by directing the fluid stream toward the lines of contact of the cutters and the rock.

Battelle also verified that effective reduction in the hardness of rock can be obtained by the use of certain electrolytes, such as caustic soda, lime, salt, aluminum chloride, in drilling mud, as previously reported by Russian investigators. Use of these chemical hardness reducers may measurably increase the rate of penetration.

**Comparison of roller bits . . .** Tests were made on the comparative action of standard and jet roller bits. It was found that the jet bit has an advantage of about two to one in flow rate over the standard bit. The added fluid turbulence created by forced streams from the jet bit is an aid in clearing chips.

To increase flow velocity and turbulence the jet bit was modified. A ½-in. angled tube was welded to each jet opening, to direct the fluid streams toward the positions of chip formation under each roller. Instead of the perpendicular stream of the standard jet bit, this modification resulted in an appreciable circumferential fluid velocity under the rollers. This measurably increased the rate of chip removal.

Actual design of a practical bit along the lines of the modified experimental model would depend on a number of factors, such as mechanical strength. Field studies will be necessary to determine the economics of the bit in relation to the pumping power required to make it work efficiently. Any changes will probably be a compromise between the ideal hydraulic system for optimum chip clearance and a long-lived bit yielding maximum drilled hole per dollar.

**Studies of drilling fluids . . .** Further experiments were carried out to determine the relative effectiveness of various fluids in chip clearance. Individual tests were designed to observe the effects of the different fluid properties: viscosity, density, filtration rate, and gel strength.

It was quickly observed that fluids of low viscosity, such as water, are much more effective in flushing chips than more viscous fluids, such as bentonite mud. Further experiments yielded data on other fluid properties.

Using the standard bit, a test was set up to see how effective various fluids were in removing chips from the hole bottom within a given time. Comparing the minimum flow rates required to meet the test conditions, it was found that the rate for water was 30 g.p.m.; barites mud, 40 g.p.m.; mineral oil, 53 g.p.m.; attapulgite mud, 65 g.p.m.; and bentonite mud, 80 g.p.m. Since the gel strength of the heavy barite mud was nearest to that of the viscous attapulgite mud, the comparison was held to be significant. It showed that greater density of the fluid reduces the flow rate for clearance in a given time, just as would lower viscosity. At the same time, the tests illustrated the effect of gel strength. While the attapulgite mud was maintained at the same Stormer viscosity as the bentonite mud, its gel strength was lower.

It should be emphasized that practical application of these findings depends on field studies. **Compromise is necessary here, too, because drilling fluids are formulated to meet a number of requirements in addition to the removal of cuttings.**

Because of the current interest in using air and natural gas in drilling, clearance times for air were also measured. Again it was found that the modified jet bit, with its directional blast of air, was most effective in removing chips.

**Experiments with hardness reducers . . .** Spot-checking the results of lengthy studies by Russian researchers, Battelle confirmed the effectiveness of "hardness reducers" in increasing drilling rates. The electrolytes used in the experiments were sodium hydroxide, calcium hydroxide, sodium carbonate, sodium silicate, and sodium phosphate.

The action of the hardness reducers depends on the penetration of the wash solution into the developing microcracks of the rock under the cutting edge of the bit. These hardness reducers apparently have a twofold action: reducing of the free surface energy by adsorption, and the binding to the surface of the microcracks of a film of water.

A sodium hydroxide solution with a concentration of 0.07 per cent showed an increase of rock breakage of 52, 56, and 57 per cent, compared with similar experiments using only distilled water. An experiment using a 0.1 per cent solution of sodium phosphate showed an increase of only 12 per cent, but this is of doubtful significance because of possible experimental errors. The other solutions tested showed no significant effects.

## BOOKS

A.S.T.M. SPECIFICATIONS FOR STEEL PIPING MATERIALS. Published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. 432 pages, heavy paper cover, $4.

The 1955 edition of this compilation sponsored by A.S.T.M. Committee A-1 on Steel contains the latest approved form of 58 A.S.T.M. specifications for ferrous pipe, tubes castings, fittings, and bolting materials.

Included in these standards, 47 of which have been revised this year, are tentative methods and definitions for mechanical testing of steel products (A 370), and classification of austenite grain size in steels (E 19). Also included are American Standards for wrought steel and wrought-iron pipe (B 36.10) and stainless-steel pipe (B 36.19).

New specifications not in the 1954 issue include specificatoins for: metal arc-welded steel pipe for high-pressure transmission service (A 381), cold-drawn wrought-iron heat-exchanger and condenser tubes (A 382), alloy-steel castings, normalized and drawn for high pressure and elevated temperature service (A 389).

These specifications, developed by Committee A-1 on Steel (comprising prominent authorities representing consumers, producers, and general interest members), are in wide-spread use.

FERROUS METALS, BOOK ON A.S.T.M. STANDARDS, Part 1 (1955). Published by the American Society for Testing Materials, 1916 Race Street, Philadelphia, Pa. 1,834 pp. (cloth cover), $13.50.

The American Society for Testing Materials has just issued Part 1—Ferrous Metals of its 1955 Book of A.S.T.M. Standards. Containing 1,834 pages and 315 standards, Part 1 is 11 per cent larger than the 1952 edition and contains 125 standards that are new or have been revised since the 1954 Supplement was published a year ago. Since 1952, 211 standards are new or have been revised.

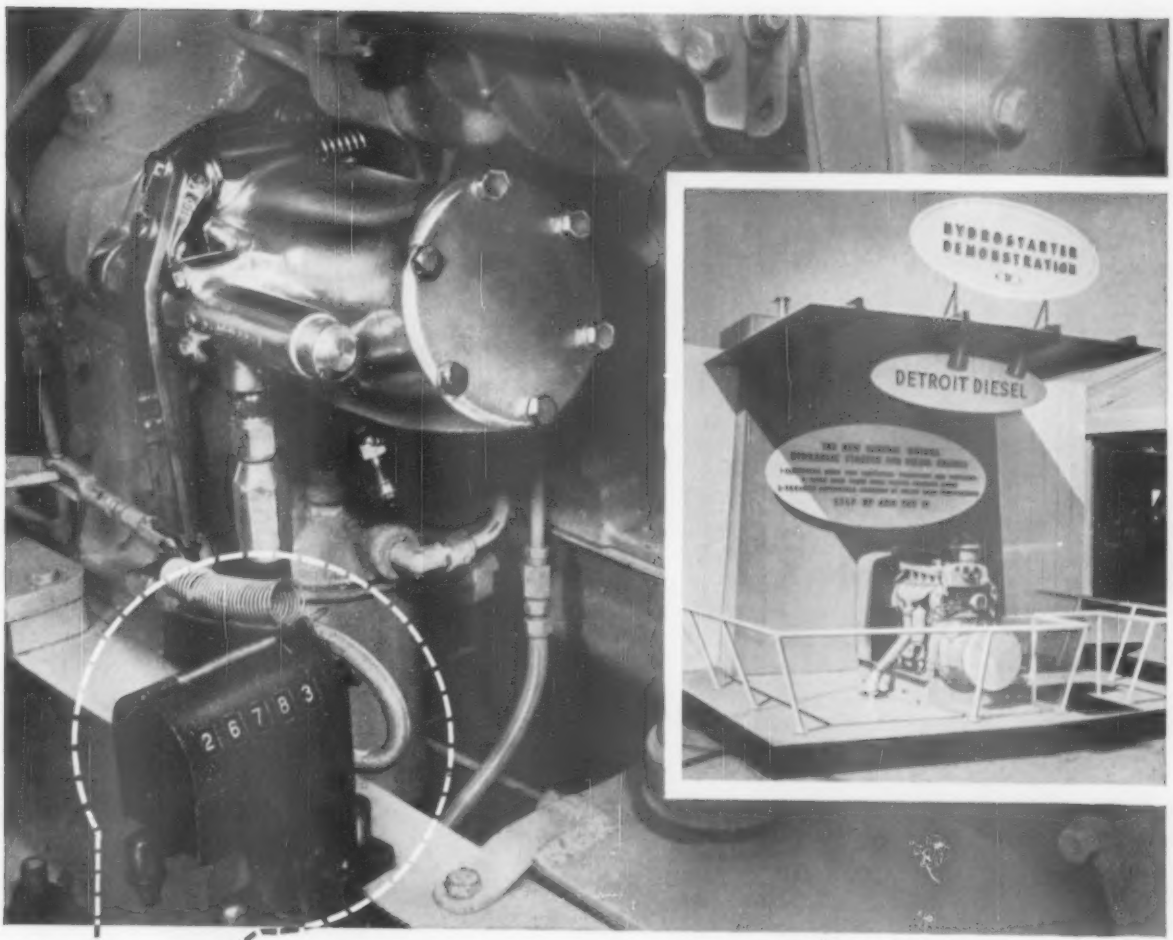
Part 1 contains standard and tentative specifications, methods of test, and definitions for: (1) steel piping materials; (2) flat products; (3) bars, bolts, and rivets; (4) billets, forgings, and axles; (5) rails and accessories; (6) railroad wheels; (7) springs; (8) concrete reinforcement; (9) corrosion-resisting steel; (10) metallic coatings for steels; (11) welding rods; (12) wrought iron; (13) cast iron; (14) malleable iron; (15) magnetic materials; (16) ferro alloys; (17) and metal powders; as well as general methods of testing.

The remaining parts of the 1955 Book of A.S.T.M. Standards will be published by the Society as rapidly as the editorial and press work can be completed. The last part is expected to be off the presses about February 1956.

The price of the complete seven-part 1955 Book of A.S.T.M. Standards is $84.

GEOLOGY AND MINERAL RESOURCES OF OKFUSKEE COUNTY, OKLAHOMA, BULL. 71. Published by Oklahoma Geological Survey, Norman, Okla. 120 pp. $2.50 (Bound in blue cloth, $3.10).

Although designed primarily as a study of the surface rocks the author, Edward Richard Ries, has included a valuable electric-log cross-section showing the principal subsurface formations. Since Okfuskee County has 92 oil or gas pools, the area is of interest to the petroleum geologist. Recently there has been considerable interest in the western part of the county and geophysics will undoubtedly find many new structures, according to the author.

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There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request

- No internal wearing parts.
- No valves, pistons, or vanes.
- No internal lubrication.
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**NASH ENGINEERING COMPANY**
**313 WILSON, SO. NORWALK, CONN.**

SENATE HOUSE, UNIVERSITY OF LONDON. The university's reference library is available to overseas students.

# How Britain Trains Its P.E.'s and Ch.E.'s

The British system provides several routes for attainment of engineering proficiency. The noncollege man may become an apprentice and enroll in evening study courses. He advances in his profession by taking a series of increasingly difficult examinations until he reaches senior status.

**by T. K. Ross**

TRADITION and development have resulted in certain differences in the type of engineering training in Britain and America. Of course, the essentials of professional competence are the same, but the order and breadth of the subjects studied vary between comparable schools in the two countries.

The British system of technical education uses many channels to attain the required level of training in the engineering professions, with the result that for well over 50 years there has been very considerable equality of opportunity in the attainment of professional status.

### Qualification by Professional Bodies

Since the earliest division of engineers into military and civil, the demands of technological advance have caused the subdivision of civil engineering into mechanical, electrical, chemical, and other branches. Each branch now has its standards and status vested in an appropriate institution, which acts as an examining and qualifying body, awarding associate membership and other grades. The examinations operated by such bodies are designed for practicing engineers entering industry from school, and taking evening study courses during their apprenticeship and subsequently until aged about 25.

The author is lecturer in chemical engineering at Birmingham University.

The Institution of Chemical Engineers, which has held an associate membership examination since 1926, has had the greatest single influence upon the chemical engineering curriculum. The unique feature of this examination is its so-called "Home Paper," requiring a candidate to prepare a complete design for one of four processes during 3 months—a severe test of practical ability. This paper is accompanied by others of the more usual theoretical kind, and during 1955 the scheme of these has been enlarged so as to represent all stages of the work. The full scheme of examination is briefly as follows:

**Part 1**

Paper A—Physical Chemistry and Principles of Thermodynamics.

Paper B—Inorganic and Organic Chemistry.

Paper C—Strength of Materials, Machine and Structural Design.

Paper D—Engineering Drawing.

**Part 2**

Paper E—Combustion Processes, Heat Transfer, and Heat Engines.

Paper F—Fluid Flow and Theory of Mass Transfer.

Paper G—Process Plant.

Paper H—Plant Construction and Works Practice.

**Part 3**

Home paper—A Problem in Chemical Engineering Plant Design.

Candidates completing successive parts are eligible for student, graduate, and associate membership of the institution, subject to satisfactory practical experience.

The scheme allows a man to prepare himself by any means whatsoever,

# COURSES IN CHEMICAL AND PETROLEUM ENGINEERING IN BRITAIN

Abbreviations: N.C.—national certificate courses. A.M. Exam.—Associate membership examination of the Institution of Chemical Engineers.

| College— | Courses provided | Head of department |
|---|---|---|
| University of Birmingham | Primary degree course (4 years). Postgraduate diploma course (1 or 2 years depending on qualifications). | Director of department who is also professor of chemical engineering. |
| University of Cambridge | Two-year degree course for students who have successfully completed at Cambridge first 2 years for primary degree in chemistry or engineering; also open to graduates in chemistry or engineering of other universities. | Professor of chemical engineering. |
| University of Durham: King's College | M.Sc. degree course for graduates in chemistry or engineering (2 years). | Professor of chemical engineering. |
| University of Glasgow | See Royal Technical College, Glasgow. | |
| University of Leeds | Primary degree course (4 years) M.Sc. degree course (2 years). | Professor of coal gas and fuel industries with metallurgy. |
| University of London: Imperial College of Science and Technology | Primary degree course (4 years). Postgraduate diploma course (2 years). | Professor of chemical technology. |
| University of London: King's College | Postgraduate diploma course (1 year). | Director of studies. |
| University of London: University College | Primary degree course (4 years). Postgraduate diploma course (1 year). | Professor of chemical engineering. |
| University of Manchester | See College of Technology, Manchester. | |
| Acton Technical College, London | N.C. course. | Head of chemistry and biology department. |
| Battersea Polytechnic, London | Primary degree course for internal degree of London University (4 years). Postgraduate diploma course for graduates in chemistry and engineering (1 year). Part-time evening courses in preparation for A.M. Exam. N.C. course under consideration. | Head of department of chemistry. |
| Birkenhead Technical College | N.C. course. | |
| College of Technology, Birmingham | Primary degree course for external degree of London University (4 years full time or 6 years part time). Part-time evening course for graduates in chemistry or engineering in preparation for A.M. Exam. | Head of department of chemistry. |
| Bradford Technical College | Primary degree course for external degree of London University (4 years). Postgraduate course for graduates in chemistry or engineering (1 year). | Head of department of chemistry and dyeing. |
| Constantine Technical College, Middlesbrough | Part-time course, courses for graduates in chemistry and engineering (4 years). | Head of department of science and metallurgy. |
| College of Technology, Cardiff | Part-time evening courses for graduates in chemistry or engineering in preparation for A.M. Exam. | Head of department of chemistry and industrial chemistry. |
| Glamorgan Technical College | Diploma course or sandwich system (4 years). | Head of department of chemistry and chemical engineering. |
| Royal Technical College, Glasgow | Primary degree course in the faculty of engineering of Glasgow University (4 years). Associateship course (4 years). N.C. course under consideration. | Professor of civil and mechanical engineering. |
| Huddersfield Technical College | N.C. course. | Head of department of chemistry, color chemistry and dyeing. |
| Hull Municipal College | Part-time day and evening courses in preparation for A.M. Exam. N.C. course. | Head of department of chemistry and biology. |
| City of Liverpool, College of Technology | Part-time evening course for graduates in chemistry (or N.C. in chemistry) in preparation for A.M. Exam. | |
| College of Technology, Loughborough | Full-time diploma course (4 or 5 years). Full-time postgraduate diploma course (1 or 2 years). | Head of department of pure and applied science and chemical engineering. |
| College of Technology, Manchester | Primary degree course (4 years) and postgraduate diploma course (1 or 2 years) in the faculty of technology of the University of Manchester. Part-time evening course for holders of N.C. in chemistry or mechanical engineering leading to A.M.C.T. (4 years). Postadvanced courses for chemists and mechanical engineers in preparation for A.M. Exam. (3 years). | Professor of chemistry. |
| The Technical College, Neath | N.C. course. | Head of science department. |
| Harris Institute, Preston | Part-time courses for graduates (or N.C.) in chemistry or engineering. | Head of science department. |
| Rutherford College of Technology, Newcastle-upon-Tyne | Part-time course for graduates (or N.C.) in chemistry or engineering (4 years). | Head of department of chemistry. |
| West Ham College of Technology, London | Primary degree course for interval degree of London University (4 years). Postgraduate diploma course for graduates in chemistry and engineering (1 year). Part-time evening course in preparation for A.M. Exam. N.C. course. | Head of department of civil, mechanical and chemical engineering. |
| Whitehaven Technical Institute, Cumberland | Part-time course in preparation for A.M. Exam. | |

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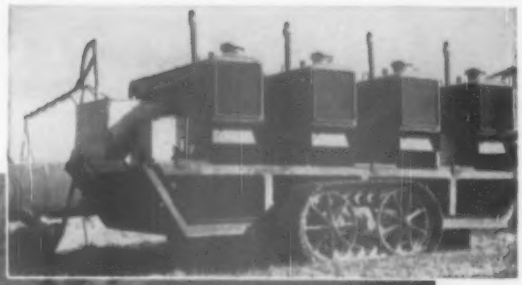
**Lincoln 600 amp Shield-Arc**
**Diesel engine-driven welders.**



# *Low costs are no pipe dream with LINCOLN welding*

Ask any pipeline contractor which engine-driven welders keep his cost down. He'll tell you Lincoln . . . 9 times out of 10.

**Here's Why:**

**Only Lincoln** gives him a truly high-duty cycle machine to keep pace with his weldors.

**Only Lincoln** gives his weldors the ultimate in speed and ease of welding with Dual Continuous Control of *both* arc type and arc intensity.

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And this is why it pays you to *standardize on Lincoln* for all pipeline, structural and refining work.

**Send for free bulletins** on Lincoln engine-driven welders and electrodes for petroleum work. Write . . .

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*The World's Largest Manufacturer of Arc Welding Equipment*

# L-P GAS TESTING EQUIPMENT

*Tests . . .*

• PROPANE • BUTANE • OTHER LIQUIFIED PETROLEUM GASES

## VAPOR PRESSURE BOMB

Designed for NGAA Standard No. 2140 requirements. Used for the determination of the gauge vapor pressure of liquified petroleum gas products. This apparatus consists of a bomb having two sections, or chambers. An upper 80% capacity chamber and a lower 20% capacity chamber. A bleeder valve, inlet valve, and chamber separating valve are included. Bomb and gauge connections use "O" ring seals permitting hand tightening. Each bomb tested to 500 psi. Range 0-300 lbs.

## CORROSION TEST BOMB

Tests the corrosiveness of LP gases. An all stainless steel bomb for corrosion tests by the copper strip method. Sealed by a neoprene "O" ring which makes it possible to make the bomb pressure tight with the hands and without wrenches. Complete with two nickel plated valves, connecting hose with swivel connections, adapter to ¼-inch pipe.

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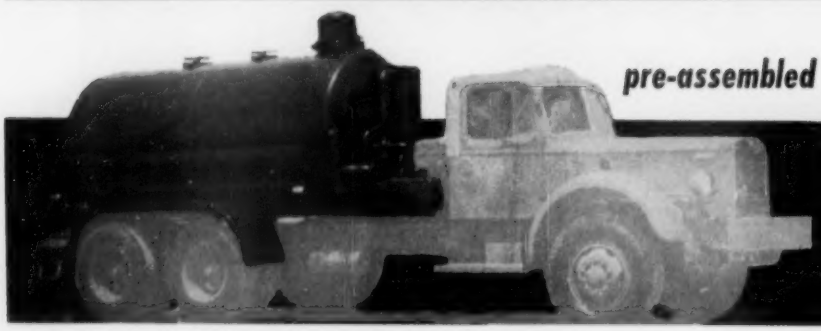

*pre-assembled* **VACUUM TANK**

*Ready to Mount on Your Truck*

**SELF-CONTAINED MODEL WT is made with capacities of 35, 40, 45, 50 and 55 bbls. Comes complete, ready for work. Has its own gasoline engine, pump and 4-way valve.**

**THOMPSON,** the originators of the unitized vacuum tank, now makes available this self-contained model WT. It's factory-readied for you to mount on any CA 120" truck in your own shops. Put the WT on your truck in the morning; put it to work after lunch!

WRITE FOR SPECIFICATIONS, complete with blueprinted mounting instructions. If you'd like to see a Thompson Unitized Vacuum Tank at work, we'll tell you where, in your own area, you can watch it save time and money — pay for itself time and time again. Write today.

***FOR SUPER-FAST CLEANING OF:***

- CRUDE TANKS
- DRAIN BOXES
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so that self-preparation is possible for shift workers. The institution allows exemptions to those already qualified in chemistry or engineering. This conversion of chemists and engineers engaged in the petroleum and chemical industries accounts for at least half of those taking the institution's examinations.

The Institute of Petroleum occupies an important position in the whole scheme of training. It is not an examining or teaching body, and does not confer formal qualifications, but it admits to membership or fellowship all those engaged in the industry who have obtained scientific or technical training elsewhere.

### Qualification by University Degree

The emergence of applied science and technology as suitable subjects for university courses, although rather slow at first, has continued at an increasing rate. Naturally, courses vary among universities, but there is much common ground concerning the essentials of an engineer's basic equipment.

Although the universities are free to determine their own curriculums, the desirability of producing graduates acceptable to the professional bodies has resulted in certain rigidities in practice. This is shown very clearly in the syllabuses for the bachelor's degree in the two largest schools in chemical engineering and petroleum, namely those of the Universities of London and Birmingham. Both universities require 4 years of full-time study where a student has passed the general certificate of education at ordinary level; if the certificate is obtained at advanced level, the first year is eliminated.

In addition, three compulsory vacation courses in industry, each of about 6 weeks' duration, are included in the third and fourth years.

Course work may be submitted for consideration at the final examination. Vacation courses are operated during all years.

### Differences in Emphasis

Comparison of these two courses shows that the same groundwork is covered in both schools, but that there are differences in emphasis. The London course suggests a more rigid division of the subjects between years; little chemical-engineering work is attempted until the final year. But at Birmingham the tendency is to introduce chemical engineering and petroleum courses much earlier in the belief that this enhances the value of later work, especially the vacation courses.

Birmingham has a single school which includes, beside the basic chemical-engineering course, a degree in petroleum production. This last follows the parent course closely, but includes geology, reservoir engineering, and production engineering.

London is made up of constituent colleges. Of these, University College, the Imperial College of Science and Technology, the Battersea Polytechnic, and the West Ham College of Technology offer the chemical-engineering course. While individual colleges have some freedom to regroup subjects within various years, the syllabus is a common one.

University of London holds a unique position in Britain through its operation of an external department which permits the award of London degrees to students carrying out their studies by full or part-time study at a variety of institutions, particularly technical colleges.

Although the greatest output of graduates in chemical and petroleum engineering in Britain is now from the first or bachelor's degree courses, these are of comparatively recent foundation. The earliest courses in these subjects were of the postgraduate nature, i.e., they were intended to convert men who had already graduated in science or engineering, in the space of 1 or 2 years. Such courses continue, and at Birmingham they have been extended to cater for scientists and engineers with some industrial experience.

### Qualification by Technical Colleges

Britain's technical colleges are the joint responsibility of the Ministry of Education and the local government authority. They provide a wide variety of instruction, ranging from crafts to scientific research. Such colleges have their historical roots in the mechanics' institutes of the nineteenth century, where artisans used to acquire the principles of engineering science. A few colleges have matured by development into the technological faculties of universities, notably the College of Technology, Manchester, and the Royal Technical College, Glasgow, and in so doing have attained autonomy. The vast majority, however, are responsible for the part-time instruction of local people wishing to obtain professional qualifications. Such full-time students as they possess are generally only a fraction of their total enrollment. These institutions are polytechnics in the fullest sense of the word, for they provide courses in every conceivable subject.

In the engineering and scientific courses, however, there are three streams of study. First, candidates are prepared for the examination of the professional institutions. Second, there are the external degrees of the University of London. The university inspects and approves such colleges as apply to prepare students for these degrees and sets the syllabus and examinations. The teaching is carried out by local lecturers with the facilities provided by the college. By these means any person employed anywhere in Britain (and even residing overseas) may be prepared for a London degree. This provision has done much to enable colleges to improve their own standards and status in the past, and at least two university colleges in Britain have proceeded to the status of autonomous universities by these means.

Third, the colleges prepare students for the national certificates in the appropriate subjects. The national certificate scheme, operated jointly by the Ministry of Education and the professional institutions, offers a qualification roughly equivalent in standard to an ordinary degree to those unable to pursue a university course. The certificates are awarded at the ordinary and higher levels. The college staff do the teaching and set the examinations. The ministry and the professional body, however, appoint assessors who inspect the college facilities and examine the examination work. Thus a compromise between local freedom and acceptable standards is arrived at.

About 9,500 scientists and 17,600 technologists and engineers are trained and qualified in Britain each year, by one or other of the routes described.

**UNIVERSITY OF BIRMINGHAM**
(B.Sc. in Chemical Engineering)

First year: Mathematics, descriptive mechanical engineering, physics, engineering drawing, chemistry, and descriptive chemical engineering.

Second year: Mathematics, electrical engineering, chemistry, and chemical engineering aspects of fuel and petroleum technology.

Third year: Applied mechanics, electrical engineering, civil engineering, chemical engineering unit operations, heat engines, petroleum refining processes, workshop processes, and thermodynamics.

Fourth year: Chemical engineering thermodynamics; advanced course in mass, heat, and momentum transfer; industrial chemical processes; thesis preparation; materials of construction and plant design; and design project.

**UNIVERSITY OF LONDON**
B.Sc. (Eng.) in Chemical Engineering

First year: Mathematics, physics, and chemistry.

Second year: Mathematics, strength of materials, theory of machines and metallurgy, mechanics of fluids, applied electricity, heat engines, and engineering drawing.

Third year: Mathematics, physical chemistry, organic chemistry, and inorganic chemistry.

Fourth year: Unit chemical engineering operations, fuels and combustion materials of construction and plant design, transport and storage of materials, site surveying and setting out of works, heat transmission, power generation and distribution organization of production.

# New Kaiser Aluminum pipe ten times lighter than steel pipe!

As you can see in the picture above, 25 feet of 4" steel pipe is a heavy load for four men.

But 30 feet of 4" Kaiser Aluminum pipe is *easily* handled by only one man—because Kaiser Aluminum pipe is more than ten times lighter than steel pipe.

Its light weight permits extremely fast handling, resulting in huge savings in loading, stringing and pickup . . . *savings up to $84.35 per mile for these items alone!*

And this is only *part* of the saving you get when you use the less costly Kaiser Aluminum pipe and coupler system for your supply lines. The newly developed detachable couplers speed connecting and disconnecting—give you an additional saving of $135.48 per mile!

Your nearby supplier stocks Kaiser Aluminum petroleum pipe in 30-foot lengths of 2, 3 and 4 inch diameters, with cladded inside surfaces that add extra resistance to corrosion. He also has couplers and fittings to complete your system.

For further information, contact the Kaiser Aluminum sales office listed in your telephone directory or any of the fitting manufacturers listed below. Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.

## SAVE UP TO $219 PER MILE!*

**(Laying one mile of 4-inch oil rig supply pipe)**

**Aluminum vs. Steel**

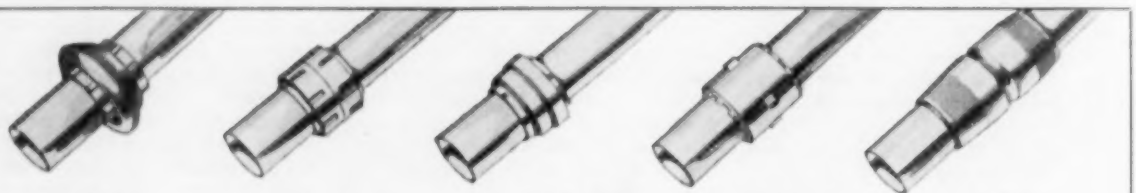
| | STEEL | | ALUMINUM | |
|---|---|---|---|---|
| OPERATION | MAN HOURS | COST | MAN HOURS | COST |
| Loading | 10.66 @ $2.20 | $ 23.46 | 3.25 @ $2.20 | $ 7.15 |
| Stringing (Trucker) | 1.66 @ $1.82 | 3.03 | .83 @ $1.82 | 1.52 |
| (Crew) | 3.33 @ $2.20 | 7.33 | 1.66 @ $2.20 | 3.65 |
| Connecting | 43.33 @ $2.20 | $ 95.33 | 3.00 @ $2.20 | $ 6.60 |
| Disconnecting | 26.25 @ $2.20 | $ 57.75 | 5.00 @ $2.20 | $11.00 |
| Pick-up and reloading (Trucker) | 7.25 @ $1.82 | 13.20 | 1.33 @ $1.82 | 2.42 |
| (Crew) | 29.00 @ $2.20 | 63.80 | 5.33 @ $2.20 | 11.73 |
| Total | 121.48 | $263.90 | 20.40 | $44.07 |

**Total savings with Kaiser Aluminum pipe—$219.83!**

*Figures compiled from extensive test installations by Kaiser Aluminum in Texas. Total savings could be more or slightly less, according to local conditions.

# Kaiser Aluminum

**setting the pace—in growth, quality and service**



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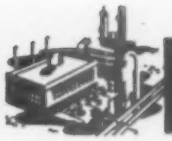
**THESE FIVE** tested and approved fittings require no welding: field tie-in may be accomplished quickly and easily. Couplers assure leakproof connections at liquid and gas pressures of 0 to 1000 psi.

**Material supplied by Worthington Corp.**

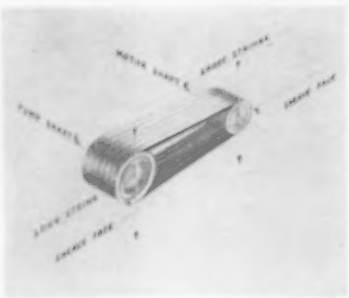


# THE FOREMAN'S PAGE

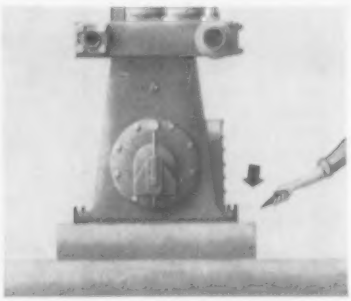
Refining · Petrochem · Natural Gasoline

## JOB IMPROVEMENT FOR THE PROCESS FOREMAN—42

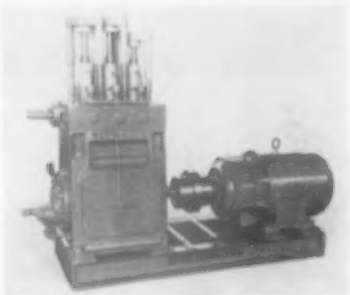
# How to Install and Maintain Power Pumps—2



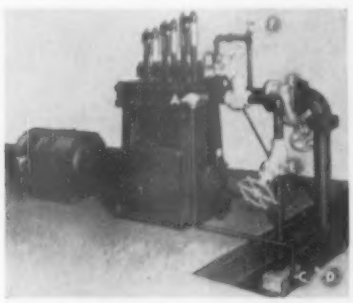
**10** To align belts, stretch string from pump to driver shaft. Drop two strings with weights, to cross long string at each shaft centerline. Long string should touch opposite sides of sheave faces without bending; short strings, top and bottom of each sheave face.



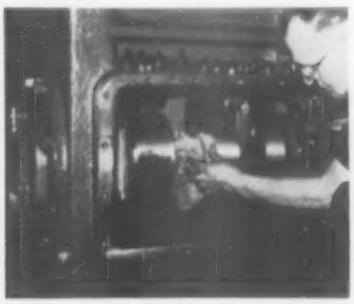
**11** Before this sets hard, remove all wedges and pour the finish grout to the final grade, filling all wedge holes. Don't leave wedges under the machinery or—when it is running—heat may cause expansion and misalignment.



**12** If you get pump and driver mounted like this, don't think it's ready to go. Base can be set on top of foundation or embedded in it. But in either case, alignment must be checked before starting, and after the concrete has cured.

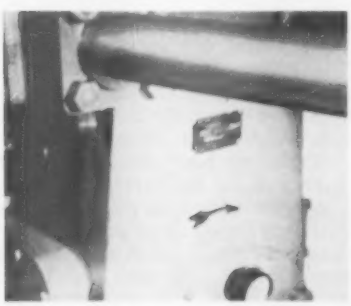


**13** Typical power pump. Note discharge relief valve. Hand bypass B starts the pump unloaded. Relief valve exhaust C and stuffing-box leakage piped to drainage D. Suction and discharge stop valves E properly placed. Note vent valve F.

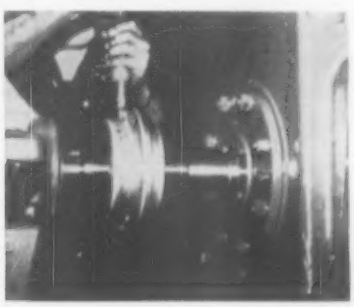


**14** Now let's clean up the pump. Wipe the dirt from all wearing surfaces and clean out the crankcase. Then remove tages and wrapping paper. Be sure to poke into all the nooks and crannies to get it all.

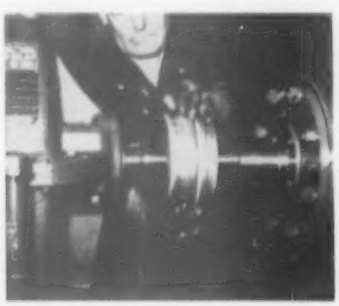
**15** The next step is to make sure the pump is properly lubricated. This means adding oil of the proper grade and quantity as recommended by the manufacturer. Some pumps have sight glasses to show the right level.



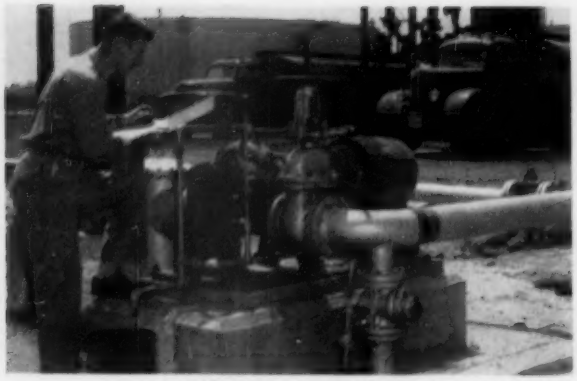
**16** Check the wiring for driver rotation to be sure it agrees with the direction recommended for the pump. A pressure oiling system won't work if the rotation is wrong. Other troubles may result, too.



**17** Now add oil—or grease, according to the manufacturer's recommendations—to the couplings. Go over all bolted connections to make sure they're tight. Be certain the pistons and stuffing boxes are packed properly.



**18** As a last check, turn the pump over by hand. It should turn freely without any binding or scraping. Open suction, air vent and bypass valves and you're ready to roll! Pump should operate properly.



A 6" double suction Goulds pump in the Norfolk, Va., plant of Cities Service Oil Company.

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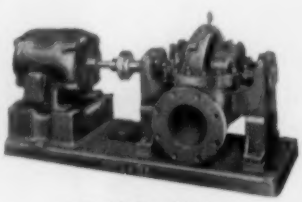

Goulds Fig. 3405

**HEAD:** If you're looking for greater pressure rather than just capacity, there are five models of Goulds Fig. 3305 two stage pump that provide heads up to 1,000 feet with capacities to 1,200 GPM.

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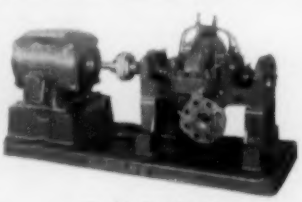

Goulds Fig. 3305

*There are many other problem-solving features in these pumps. To get the complete picture send for: Bulletin 721.6 on the single stage pump and Bulletin 722.6 on the two stage.*

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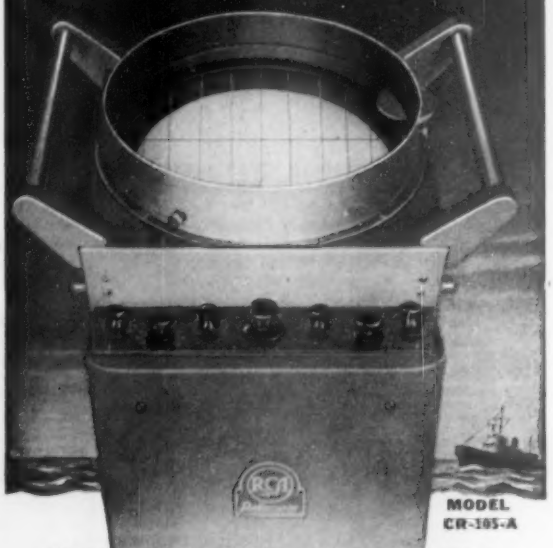

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# 7. How to Estimate Fractionator Costs

**by W. L. Nelson**
Technical Editor

ALTHOUGH much has been published on the cost of towers, agreement is not good. Note the wide variation in the cost of installed plates or trays shown in Table 4. The cost of miscellaneous fractionator items is indicated in Table 3. The weight of steel shells, heads, and various connections may be obtained from Cost-imating No. 5 of this series (January 23, 1956), as well as the cost of steel in vessels or towers.

**Example (refer to Table 2) . . .** A 6-ft.-diameter fractionator has a total length, including the skirt, of 50 ft. The shell is ⅝ in. thick and heads are ¾ in. thick. The tower contains 18 steel bubble trays, each with an 18-in. manhole and there is another manhole at the bottom. It has the numerous connections shown in Table 2.

The cost of $15,460 of Table 2 does not include insulation, ladders, platforms, X-ray inspection, or stress relieving. The price in 1955 would be higher by an index of about 1.70 (see Table 1) making a current cost of about $26,250.

Comparison with the quick-estimate method of Table 5 indicates that a complete installation (foundations, insulation, etc.) would cost about $21,200 (1946) rather than $15,460, or about 37 per cent more.

### Quick Tower Estimates

Although Table 5 may be used to estimate the total cost of a fractionator, it is obvious that great variations must occur because of different wall thicknesses, designs, numbers of manholes, etc. Two such quick methods[12 13] show values only about half as large as those of Table 5 and accordingly, must apply to incomplete installations or to towers with few manholes. Obviously it is advisable whenever possible to use detailed methods[9 10] rather than quick methods of estimating.

In preparing Table 5 the fittings for the ½ and ¾-in. thickness towers are standard 300-lb. fittings but for the ¼-in.-thickness towers only 150-lb. fittings were employed. The heads on all towers are ⅛ in. thicker than the straight shells. An 18-in. manhole is supplied for each tray (and one extra), customary vapor and liquid lines and openings are provided, liquid holdup space and a support skirt totaling 12-16 ft. of shell is provided, the tower is equipped with a ladder with guards and a platform at the top, structural steel as needed is provided at the base and top, the towers are insulated with a 2½-in. layer of magnesia lagging, the foundation is adequate for an 80-m.p.h. wind, and

TABLE 1—COST INDEXES FOR STEEL (1946 = 100)[7]

| | Plate steel | Structural shapes | Wages, structural iron workers* | Wages, sheet metal workers* | Wages, refinery labor | Nelson construction index[7] |
|---|---|---|---|---|---|---|
| 1946 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1947 | 117.5 | 113.4 | 113 | 112 | 113 | 117 |
| 1948 | 140 | 138 | 132 | 124 | 128 | 132.5 |
| 1949 | 134.8 | 151.2 | 133 | 127 | 137 | 139.7 |
| 1950 | 136 | 162.3 | 139 | 134 | 144 | 146.2 |
| 1951 | 156.1 | 172.3 | 149 | 141 | 152 | 157.2 |
| 1952 | 153.4 | 176.2 | 151 | 152 | 163 | 163.6 |
| 1953 | 150.3 | 185.7 | 159 | 159 | 174 | 173.5 |
| 1954 | 147.3 | 193.4 | 176 | 167 | 183 | 179.8 |
| 1955 est. | 154 | 212.0 | 183 | 173 | 190 | 184.5 |

*Indexes based on U. S. Bureau of Labor Statistics. During 1946 wages in New York were $2.25 per hour for iron workers and about $2.35 for sheet metal workers. For other regions 1946 wages are estimated as $1.80 and $1.90 per hour.

TABLE 2—ESTIMATE OF THE COST OF A FRACTIONATOR (SEE EXAMPLE)

| | M. & L. (1946) | References |
|---|---|---|
| One shell, 50 by 481 = 24,050 lb. | | 11 |
| One set heads = 2,360 lb. | | 11 |
| 26,410 lb. at 12 cents per lb. | $3,170 | 11 |
| Nineteen manholes, 18-in. at $335 | 6,365 | 11 |
| One vapor line nozzle, 10-in. at $115 | 115 | 11 |
| Three nozzles, 4-in. at $41 | 123 | 11 |
| Six nozzles, 2-in. at $24 | 144 | 11 |
| Six couplings, 1-in. at $2.70 | 16 | 11 |
| Seven insulation rings, 7 by 46 = 322 lb. | | 10 |
| One lot, steel at base, etc. = 315 lb. | | 10 |
| 637 lb. at 27 cents per lb. | 172 | 11 |
| Eighteen bubble trays, complete at $210 | 3,780 | Table 1 |
| Total shop cost | $13,885 | |
| One job erection at 10 per cent (no field assembly) | $1,388 | Table 2 |
| One job freight, 300 miles on 25 tons at 2.5 cents per ton-mile | 187 | 11 |
| | $15,460 | |

the towers are considered to be stress-relieved, examined by X-ray, and set on the foundation.

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**TABLE 5—QUICK ESTIMATE OF TOWER COSTS, 1946***

(Dollar per tray for complete towers including insulation, freight, foundation, ladder, one platform, connectings, stress-relieving, X-ray inspection, and erection)

| Diameter (ft.) | Thickness, ¼-in. | | Thickness, ½-in. | | Thickness, ¾-in. | |
|---|---|---|---|---|---|---|
| | 8 plates | 30 plates | 8 plates | 30 plates | 8 plates | 30 plates |
| 3 | 540 | 710 | 665 | 890 | 740 | 980 |
| 4 | 630 | 840 | 760 | 1,030 | 835 | 1,120 |
| 5 | 725 | 965 | 855 | 1,160 | 920 | 1,260 |
| 6 | 835 | 1,105 | 965 | 1,320 | 1,035 | 1,435 |
| 7 | 950 | 1,270 | 1,100 | 1,500 | 1,170 | 1,600 |
| 8 | 1,100 | 1,470 | 1,250 | 1,750 | 1,340 | 1,840 |
| 9 | 1,275 | 1,750 | 1,450 | 2,050 | 1,580 | 2,150 |
| 10 | 1,510 | 2,000 | 1,700 | 2,360 | 1,840 | 2,480 |
| 11 | 1,780 | 2,330 | 1,960 | 2,720 | 2,110 | 2,850 |
| 12 | 2,050 | 2,700 | 2,260 | 3,130 | 2,420 | 3,250 |
| 13 | ..... | ..... | 2,600 | 3,590 | 2,750 | 3,730 |
| 14 | ..... | ..... | 2,960 | 4,070 | 3,100 | 4,200 |

*The "per tray" cost of 60-plate towers is about 93 per cent of the cost of 30-plate towers.

**TABLE 3—APPROXIMATE COSTS OF FRACTIONATOR ITEMS (1946)**
(In dollars)

| | Material | Labor | M. & L. |
|---|---|---|---|
| Platform, walkway, ladder, etc., steel, per lb.[9] | 0.08-0.19 | 0.02-0.08 | 0.10-0.26 |
| Tray support steel,[2,3] per lb. | 0.10-0.22 | 0.05-0.25 | 0.15-0.43 |
| Tray supports, stainless,[2] per lb. | ..... | ..... | 1.05 |
| Trays, downspouts, reinforcing at top and bottom,[3] steel, per lb. | 0.10-0.25 | 0.05-0.15 | 0.25-0.30 |
| Caps, 3-in. steel,[3,6] each | 0.24-0.86 | 0.25-0.50 | 0.70-1.10 |
| Caps, 4-in. steel,[6] and cast iron,[3] each | 0.57-0.93 | 0.25-0.50 | 0.82-1.23 |
| Caps, 6-in. steel,[6] each | 1.17 | 0.25-0.50 | 0.40-1.70 |
| Caps, 3-in. stainless 410,[6] each | *0.72 | 0.25-0.50 | *0.95-1.20 |
| Caps, 4-in. stainless 410,[3,6] each | *0.51-0.91 | 0.25-0.50 | *0.86-1.40 |
| Caps, 6-in. stainless 410,[6] each | *1.18 | 0.25-0.50 | *1.45-1.80 |
| Raschig rings, carbon:[3,6] | | | |
| ½-in. per cu. ft. | 10-11 | 2 | 12-13 |
| ¾-in. per cu. ft. | 8 | 2 | 10 |
| 1-in. per cu. ft. | 5-6 | 2 | 7-8 |
| 1½-2-in. per cu. ft. | 4-5 | 2 | 6-7 |
| Berl saddles, stoneware:[6] | | | |
| ½-in. per cu. ft. | 19 | 2 | 21 |
| ¾-in. per cu. ft. | 12.50 | 2 | 14.50 |
| 1-in. per cu. ft. | 7.30 | 2 | 9.30 |
| Quartz, ¼-in. to 4-in. per cu. ft. | 2.10 | 1-2 | 3-4 |
| Wire-mesh screen, 4-in. thickness stainless, incl. supports,[3] per sq. ft. | 7-10 | 2.60 | 10-13 |
| Erection,[4] per cent material | .... | .... | 10-30 |

*Material price rose by over 250 per cent between 1946 and 1949.

**TABLE 6—POWER PLATFORMS AND LADDERS (1946)***

| | |
|---|---|
| Steel, structural, cents per lb. | 15 |
| Ladder, complete, per ft. | $4-$8 |
| Platform: | |
| 3-ft.-diameter tower | $210 |
| 5-ft.-diameter tower | 320 |
| 7-ft.-diameter tower | 410 |
| 10-ft.-diameter tower | 520 |
| 13-ft.-diameter tower | 650 |

**TABLE 4—APPROXIMATE COST OF INSTALLED BUBBLE TRAYS, PANS, ETC. (1946)**
(Dollars each)

| Diameter | Cast iron[1,2,4] bubble trays | Steel[3,4,6,15] bubble trays* | Stainless[2,3,6] bubble trays | Installation alone,[2,6] bubble trays | Side-to-side pan[3] steel | Newer design stainless trays†[15] Perforated | Turbogrid Stamped | Turbogrid Bar stock |
|---|---|---|---|---|---|---|---|---|
| 2 | 35 ( 31- 47) | 45 ( 31- 47) | ..... | ..... | ..... | ..... | ..... | ..... |
| 3 | 70 ( 53- 106) | 80 ( 65- 106) | 98 | 13 | ..... | 65 | 55 | 50 |
| 4 | 110 ( 88- 188) | 100 ( 72- 188) | 155 (154- 155) | 19 | 50 | 97 | 70 | 52 |
| 5 | 180 (134- 294) | 155 ( 105- 294) | 235 (214- 324) | 29 | 80 | 118 | 95 | 65 |
| 6 | 250 (162- 423) | 210 ( 131- 423) | 320 (292- 342) | 42 | 100 | 147 | 115 | 90 |
| 7 | 330 (255- 585) | 270 ( 210- 585) | 475 (370- 505) | 56 | 130 | 190 | 148 | 113 |
| 8 | 430 (323- 753) | 355 ( 262- 753) | 600 (487- 658) | 73 | 175 | 260 | 185 | 138 |
| 9 | 570 (398- 953) | 450 ( 391- 953) | 786 | 95 | 225 | 330 | 222 | 170 |
| 10 | 770 (468-1,177) | 550 ( 450-1,177) | 960 (930-1,000) | 115 | 275 | 402 | ..... | ..... |
| 11 | (538-1,425) | 720 ( 580-1,425) | ..... | 150 | 360 | 475 | ..... | ..... |
| 12 | ..... | 925 ( 730-1,670) | ..... | 195 | 510 | ..... | ..... | ..... |
| 13 | ..... | 1,150 ( 900-2,000) | ..... | 247 | 630 | ..... | ..... | ..... |
| 14 | ..... | 1,400 (1,070-2,310) | ..... | 300 | 840 | ..... | ..... | ..... |
| 16 | ..... | 1,800 (1,550-1,900) | ..... | 395 | 1,100 | ..... | ..... | ..... |
| 18 | ..... | 2,270 (2,020-2,300) | ..... | ..... | 1,470 | ..... | ..... | ..... |
| 20 | ..... | 3,300 | ..... | ..... | ..... | ..... | ..... | ..... |

*Drawplates cost about 50 per cent more than regular trays, but a well (no caps) in the tower for drawing off liquid costs about the same as a bubble tray. †Uniflow trays cost about 40-60 per cent as much as bubble trays of the same materials, and Flexitrays about 60-80 per cent, according to Katzen.[15]

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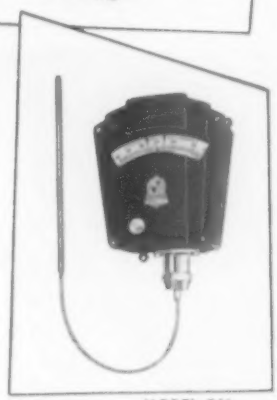

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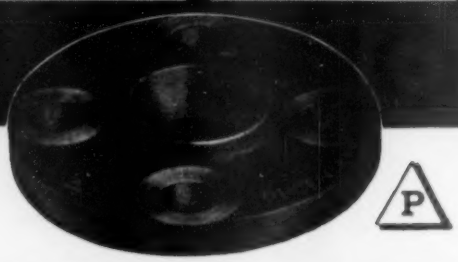

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# Solving the Mercaptide Gel Problem

by J. P. Kirchner, D. P. Osterhout, and W. R. Schwindeman

SLUDGE formation was covered in Installment 1. Discussion of mercaptide gel formation was begun in Installment 2.

Aside from the presence of mercaptans of the proper types, water must also be present to achieve the maximum amount of gel formation. Laboratory studies of the conditions affecting gel formation show that distilled water, salt water, and caustic are increasingly harmful. This is illustrated in Table 5. The mechanism involved here is probably a corrosive attack of the brass to release copper ions. Also, the gel itself is stabilized by the trace amount of water found in it.

**Field test . . .** This was conducted for the purpose of correlating the rate of gel formation of various fuels in full-scale equipment with the results of the laboratory gel test. Brass test specimens were placed in the fuel system of the test units and periodically removed and analyzed for copper mercaptide gel. Table 6 illustrates that the weight of the gel deposits obtained from these specimens correlates with the amount of gel formed on the brass test filters from the laboratory test.

**On copper, too? . . .** One fundamental question which has not yet been settled is whether copper mercaptide gel forms exclusively on brass or whether it will form on copper. The authors' field experience has supported the stand that it **forms** exclusively on brass surfaces, or on the copper at a junction of copper with galvanized (zinc) pipe. It may, of course, be found on an iron screen where it has been caught after being dislodged from a brass portion of the system upstream of the filter.

Careful inspection of copper lines and parts has never revealed either gel or evidence of a corrosive attack on the copper such as is normally observed on brass which has had gel on it. One possible explanation for this is that copper usually tarnishes quite readily (relative to brass) and this might make it less subject to attack by mercaptans.

On the other hand, informally received reports from others who have observed this phenomenon indicate that, in their opinion, gel forms quite readily in copper fuel lines. In an effort to check this report, special copper filters were run in the laboratory gel test in comparison with the standard brass filter. Only a small amount of gel was found on the copper in comparison with that on the brass filter. These data are given in Table 7.

Authors are with Socony Mobil Oil Co., Inc., at Paulsboro, N. J. From paper presented at A.S.M.E. meeting, Chicago.

### Additional Refining

The best approach to the solution of the gel problem is to remove the offending mercaptans from the fuel by additional refining. Any treating method employed should remove as much of the mercaptan as possible. This is essential because gel formation continues even at low mercaptan levels. And if the burner or diesel-fuel system is not thoroughly cleaned at intervals, gel will accumulate and ultimately result in trouble.

A mixture of two distillate fuel additives has been developed which reduces the gel-forming tendency of a fuel. But it appears that elimination of the mercaptan by refining may be the best approach due to its other contributions to product quality.

TABLE 5—EFFECT OF FREE-WATER TYPE ON GEL FORMATION

| Water— | pH | Micrograms sulfur as mercaptan recovered from test filter |
|---|---|---|
| Distilled water | 7 | 270; 220 |
| Synthetic sea water | 8 | 620; 590 |
| Distilled + 1 per cent NaOH | 11 | 1,600; 1,300 |
| Distilled + 1 per cent HCl | 1 | 200; 200 |
| Distilled + 1 per cent NaCl | 7 | 400; 300 |

### Effects of Treating and Additives

There are a number of additives and refining techniques that may be applied to solve both the storage-stability and mercaptide-gel problems. In some instances, the same remedy may be used to solve both problems. The actual selection of a specific remedy will vary with each refiner.

**Additives . . .** There are two types of additives that may be used to remedy the fuel-oil sludge problem. The first of these is commonly known as a dispersant, or more accurately an antiscreen-clogging agent. This type of additive does not prevent the formation of sludge. But it does enable the sludge to pass through strainers and filters and be burned without causing any difficulties. Antiscreen-clogging properties can be imparted to fuels only by additives. It has been the authors' experience that a fuel containing an antiscreen-clogging agent may produce two to three times as much sludge as one which contains no additive and still provide trouble-free performance.

TABLE 6—CORRELATION OF FIELD TEST WITH LABORATORY TEST

| Fuel | Micrograms of sulfur as mercaptan: Field-test specimen | Micrograms of sulfur as mercaptan: Laboratory-test filter |
|---|---|---|
| 1 | 500 | 150 |
| 2 | 160 | 40 |
| 3 | 510 | 135 |

TABLE 7—COMPARISON OF BRASS AND COPPER TEST FILTERS

| Sample | Type filter— | Micrograms sulfur as mercaptan recovered from test filter |
|---|---|---|
| 1 | Brass | 200; 180 |
| 1 | Copper | 80; 70 |
| 2 | Brass | 100; 90 |
| 2 | Copper | 20; 15 |
| 3 | Brass | 400 |
| 3 | Copper | 100 |

# Pipeline Patrol

*. . . Report on Construction*

## Under Way, Contracted, and Planned

PIPELINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by • preceding the job.

### Crude-Oil Pipelines

**Lakehead Pipe Line Co., Inc.**—Company has let 51 miles of 26-in. line to Anderson Brothers Corp., Houston. The job is expected to be completed during the summer of 1956 and is in conjunction with 69 miles of 24 and 26-in. looping that Interprovincial Pipe Line Co. will also complete next summer (see Interprovincial under Canada, also).

• **Offshore Gathering Corp.**—This Houston company has proposed to build a natural-gas and a crude-oil line to gather gas and crude in the Gulf of Mexico off Louisiana. The gas line will be comprised of 60 miles of 24-in., 70 miles of 26-in., and 234 miles of 30-in. The crude line will be mostly 20-in. Each line will be about 364 miles in length. Estimated cost of the lines is $150,000,000.

• **Sinclair Pipe Line Co.**—Company will build a 300-mile crude line form Jacksboro, Tex., to Houston. The project will cost $14,000,000 and require 3 years to complete. The 150-mile portion from Jacksboro to Mexia will be 18-in. pipe. The Mexia-Houston portion will be 20-in. River Construction Corp. has Jacksboro to Mexia project.

• **Union Oil Co. of California.**—Company proposes to build an 815-mile line from Rifle, Colo., to Los Angeles to carry the products from its proposed Rifle, Colo., shale-oil plant to the Los Angeles refining area. The line would cost approximately $56,000,000.

• **U. S. Defense Department.** — Defense officials are considering a 97-mile, $8,000,000 line from the Elk Hills Naval Reserve in California to the Los Angeles refining area.

• **West Coast Pipeline Co.**—Proposed big-inch crude line from Wink, Tex. to Norwalk, Calif. Company has repeatedly sought Federal aid to build line and has been turned down. Plans still in effect however.

### Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area.

**Cosden Petroleum Corp.**—Company is building 100 miles of 6-in. line from its refinery at Big Spring to Abilene, Tex. C. O. Holder Construction Co., of Snyder, Tex., has contract.

• **El Paso Natural Gas Co.**—Firm has disclosed plans to build a 240-mile, "larger than 6-in." line from the Permian basin to El Paso. The line will start in the vicinity of the firm's Midkiff natural-gasoline plant in Midland County, Texas. The new line will carry natural gasoline, butane, and propane.

• **Gulf Refining Co.**—Firm will build a 45-mile, 8-in. products line from Pontiac Eastern Corp.'s planned refinery at Hattiesburg, Miss., to a connection with Plantation Pipe Line Co.'s system. The refinery isn't due on stream until May 1957, and no definite time has been set for start of laying the line.

• **Phillips Chemical Co.**—Firm plans a 50-mile, 4-in. ethylene line from Sweeny, Tex., to Port Adams, Tex. The estimated date of completion is set for October 1, 1956.

• **Phillips Pipe Line Co.**—Firm plans 64-mile, 12-in. products line from Sweeny to Houston. Completion set for April 1956.

**Plantation Pipe Line Co.**—Firm will spend $23,500,000 in 1956 to expand its system from Baton Rouge, La., to Greensboro, N. C. The company will lay 327 miles of 18-in. from Baton Rouge to just south of Birmingham at Helena, Ala. The new line will increase capacity from 245,000 bbl. daily to 304,000 bbl.

• **Sioux Oil Co.**—Firm plans to build 80-mile, 4½-in. line from its Newcastle, Wyo., refinery to Rapid City, S. D. The line is slated for completion in late 1956.

**Southern Pacific Pipe Line Corp.**—Firm has let an 87-mile, 6-in. products line from its main line at Phoenix to Davis Monathan Air Force Base. Engineers Limited Pipeline Co., of San Francisco has the job. Firm has also let a 76-mile, 6-in. project from near Phoenix to Luke Air Force Base. Hood Construction Co., of Lynwood, Calif., has the job. A 14-mile, 6-in. line from Colton, Calif., to March Air Force Base will be let later.

• **Sun Pipe Line Co.**—Firm will build 110 miles of 14-in. from Twin Oaks, Pa., to Newark. The line will have a 83,000-bbl. capacity and will replace an existing 8-in. line. September 15, 1956, is expected completion date.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport L.P.G. from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

• **Tennessee Gas Transmission Co.**—Firm has announced plans for a 200-mile butane line from its natural-gasoline plant west of Corpus Christi, Tex., to the Houston area. The butane will be sold to Petro-Tex Chemical Corp., which operates one of the nation's largest butadiene plants here.

**Texas Eastern Transmission Corp.**—Company has received Federal Power Commission approval to abandon the "Little Inch" gas line and to convert it to products service. The company will spend $13,000,000 converting the line back to products. When finished the line will have a capacity of 235,000 bbl. daily.

### Non-Petroleum Pipelines

**American Gilsonite Co.**—Company has announced plans for a 100-mile pipeline from near Bonanza, Utah, to a proposed gilsonite refinery in western Colorado. The company, owned by Barber Oil Corp. and Standard Oil Co. of California, plans to make gasoline and coke by refining gilsonite. The gilsonite would be moved in a slurry.

**Pittsburgh Consolidation Coal Co.**—This firm has announced plans for the first pipeline to move coal. The line will be 108 miles of 10-in. from the company's Georgetown mines in eastern Ohio to Cleveland Electric Illuminating Co.'s Eastlake power plant northeast of Cleveland. Ford, Bacon & Davis, Inc., will issue specifications, let contracts, and supervise the construction work. Willims Bros. has contract and has shut down for the winter.

### Natural-Gas Pipelines

**American Louisiana Pipe Line Co.**—Company has let bulk of its 1,121-mile line from North Tepetate, La., to Detroit. Only a 22-in. spur from Payne, Ind., to Bridgman, Mich., is still not awarded. H. C. Price Co., Bartlesville, Okla., has 783 miles of 30-in. pipe. One section will work south from the Hancock-Henry County line and the other will work north from Slaughters, Ky. Brown & Root has 221 miles of 30-in. from North Tepetate to the Louisiana-Arkansas border, and 39 miles of 16-in. line to be built under water. The firm has subcontracted the 221 miles to Associated Pipe Line Contractors and Western Contractors. It will lay the under-water line itself.

• **Arkansas Louisiana Gas Co.**—Firm has announced long-range plans to build a $50,000,000 pipeline from the Texas-Louisiana coastal region to northern Louisiana. The line would connect with the company's present system.

• **Carolina Pipeline Co.**—This newly organized firm has applied to the South Carolina Public Service Commission for permission to distribute natural gas in central South Carolina. The firm plans to build $8,700,000 worth of distribution lines to 14 cities. Other towns in the area without natural-gas service may be included eventually. The new firm plans to buy gas from either Transcontinental Gas Pipeline Co. or Southern Natural Gas Co.

• **Carolina Natural Gas Corp.**—185 miles 8-12-in., proposed lateral lines off Transcontinental in North and South Carolina.

**Cascade Natural Gas Co.**—Firm has let contract to Engineering Construction Co., of Tulsa, for 400 miles of gas distribution lines in the State of Washington. The lines will range from ¾ to 12-in. and will be laid in the towns of Yakima, Grandview, Granger, Trosper, Sunnyside, Toppenish, Union Gap, Wahpato, and Zillah. Work will start April 1.

• **Cities of Clarendon and Marvell, Ark.**—Cities have filed for FPC permission to interconnect their facilities with Texas Gas Corp.'s line south of Helena, Ark. The cities will build 53 miles of 4, 5, and 6-in line to transport the gas.

• **Coastal Transmission Co.** — Company plans to build 550 miles of 30-in. line from near McAllen in South Texas to near Baton Rouge (See Houston, Texas Gas & Oil Co.)

• **Colonial Natural Gas Corp.**—Company proposes to build two systems, one from the Houston-Lake Charles area to Miami, Fla., and the other in the Carolinas and Georgia. Neither idea is before the FPC yet.

• **Colorado Interstate Gas Co.**—Firm completed 136 miles of 22-in. from Laramie, Wyo., to Denver in November. Second part of line from Laramie to Rock Springs, Wyo., will be laid in 1956. The second section will be 238 miles of 22-in. pipe and will be completed about October 1.

• **El Paso Natural Gas Co.**—Firm has received FPC permission to loop 450 miles of 34-in. line from the San Juan basin to the Colorado River at the Arizona-California border.

• **Houston Texas Gas & Oil Co.**—Company has applied to FPC for permission to lay a 960-mile gas line between Baton Rouge and Miami. The main line would consist of 507 miles of 30-in., 157 miles of 26-in., 61 miles of 20-in., 224 miles of 18-in., and 12 miles of 12-in. Company also plans 500 miles of sales laterals in Florida. Main line would join with Coastal Transmission's proposed line from McAllen to Baton Rouge.

• **Iron Ranges Natural Gas Co.**—This St.

## Pipeline Patrol

Paul company has filed an application with the FPC to build a 68-mile transmission line and 47 miles of laterals to supply various towns and cities on the Mesabi Iron Range in Minnesota.

• **Lone Star Gas Co.**—Company has two plans up before FPC to enlarge its system in Texas and Oklahoma. One is for an $18,000,000, 230-mile line from Cotton County Oklahoma, to Fritch, Tex. The other plan is for a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. The company hopes to prevent Natural Gas Pipeline Co. of America from building its line from Wise County, Texas, to Fritch (see below).

• **Michigan Consolidated Gas Co.**—2[illegible] miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in loops. Majority will be in Wisconsin.

• **Midwestern Gas Transmission Co.**—Company will build a main line from Portland, Tenn., to Canadian border near Emerson, Man., Canada. Extensions from main line to cities in Minnesota and Wisconsin are also planned. The main line will be comprised of 829 miles of 24-in., 109 miles of 16-in., and 174 miles of 12-in. The extensions will total 648 miles of 3 to 18-in. pipe. The application is now pending with the FPC.

• **Natural Gas Pipeline Co. of America.**—Company has FPC examiner's approval to build 350 miles of 20 and 26-in. line from Jack and Wise counties in North Texas to Fritch, Tex., near Borger. Approval and its conditions will be contested by both Natural Gas Pipeline and Lone Star Gas Co.

**Nevada Natural Gas Co.**—Company plans looping program along its 114-mile line from Needles, Calif., to Las Vegas, Nev. Mileage and size are unknown but cost will be about $2,500,000.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia to Narrows and Dublin, Va.

• **North Carolina Natural Gas Corp.**—This subsidiary of Colonial Natural Gas Corp. (formerly Texas-Ohio Gas Co.) has received permission from the North Carolina Utilities Commission to build 575 miles of gas lines in the state. The system will range in size from 3 to 16-in. and will cost about $13,000,000. The line will run from a point on Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across North Carolina. It will deliver gas to customers in a territory lying east of Charlotte and south of Lexington, Sanford, and Raleigh.

• **Northern Natural Gas Co.**—Company plans to spend $32,000,000 to add 348 miles of main line and 307 miles of branch lines in Wisconsin, Minnesota, South Dakota, and Iowa. The application is before the FPC now. The main lines include 169 miles in the Duluth-Superior area and 164 miles in the Aberdeen area of South Dakota.

• **Pacific Gas & Electric Co.**—Company's long-range plans call for looping the Topock-Milpitas line with 135 miles of 34-in. The major part of the line will be laid in 1956, while 62 miles will be laid in 1957.

**Pacific Northwest Pipe Line Corp.**—Firm has let its 1,446 mile gas line from the San Juan basin to Bellingham, Wash. Seven hundred miles now laid. Contractors and their sections are:

River Construction Corp., two sections totalling 150 miles of 26-in. between Ignacio, Colo., and Moab, Utah.

R. H. Fulton Co., two sections totalling 160 miles of 26-in. between Moab and Jensen, Utah.

Associated Pipeline Contractors, Inc., one section of 77.6 miles of 26-in. between Jensen and Green River, Wyo.

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A. J. Curtis Construction Co., one section of 82.8 miles of 22-in. from Green River to Sage, Wyo. Completed.

B & M Construction Corp., one section of 90 miles of 22-in. between Sage and Lava Hot Springs, Idaho.

Midwestern Constructors, Inc., one section of 95 miles of 22-in. from Hot Springs to Burley, Idaho.

H. B. Zachry Co., San Antonio, sections 9 and 10, 214 miles of 22-in. between Burley and Payette, Idaho.

Fulghum Construction Co., Harrisburg, Pa., sections 11 and 12, 198 miles of 22-in. between Payette and the Columbia River at the Oregon-Washington border.

A. J. Curtis Construction Co., Casper, section 26, 54 miles of 16-in. laterals and 31 miles of gathering-system lines from a point on the main line near Kemmerer, Wyo., to Big Piney field, Wyoming.

R. H. Fulton, Lubbock, section 27, 43 miles of lateral lines and 16 miles of gathering lines from Rangely, Colo., to Piceance Creek field, Colorado.

H. B. Zachry Co., San Antonio, has contract for 42 miles of 4 to 16-in. line in the San Juan basin area of New Mexico. Pipe laying began in January.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Gloucester, Mass., area to Bangor, Me.

**Pioneer Natural Gas Co.**—R. H. Fulton & Co., Lubbock, Tex., has started construction on 56 miles of line for this company near Lamesa, Tex. Twenty-eight miles of 22-in. and 28 miles of 10-in. make up the job.

**Portland Gas & Coke Co.**—United Engineers & Constructors, Inc., of Philadelphia, has engineering contract for 80 miles of various size lines up to 16-in. for this Portland, Ore., firm. River Construction Corp. is winding up work on a 16-in. river crossing of the Williamette River for the company.

**Private Interests.**—Proposes to build gas line from Gubik gas field near Navy Petroleum Reserve No. 4 in Alaska to Fairbanks. Line would be 450-mile, 8-in. line and Arctic Contractor, Inc., who handled engineering requirements and preliminary design estimated the line would cost $20,000,000 although later figures have been much higher than this.

• **Southern California Gas Co.** and **Southern Counties Gas Co. of California.**—Firms have plans for three separate jobs. First is 19 miles of 30-in. from Placentia to Compton, Calif. Completion set for November 1956. Second job is 70 miles of 30-in. from Palmdale to Alhambra, Calif., and completion is slated for November, too. Third job is 210 miles of 30-in. from Topock to Palmdale. Last job not expected to be finished before April 1957.

• **Southern Natural Gas Co.**—Company has temporary FPC authority to build 39 miles of loop lines and add 4,950 hp. to its compressor power near Atlanta, Ga. Job will cost about $2,000,000.

**Tennessee Gas Transmission Co.**—The firm has the following projects under way or planned.

**Project 1**—370 miles of 30-in. line from Agua Dulce, Tex., to Kinder, La. Contractors are Morrison Constructors, Inc.; Williams Bros.; Houston Contracting Co.; H. C. Price Co.; Western Constructors; N. A. Saigh Co.; Panama-Williams Co.; and Associated Pipe Line Constructors, Inc. Completed.

**Project 2**—250 miles of 24-in. from Coudersport, Pa., to Greenwich, Conn. Contractors are H. C. Price, Bechtel Corp., and Pentzien, Inc. Completed.

**Project 3**—147 miles of 26-in. and 74 miles of 30-in. Thirty runs from Cave City, Ky., to Danville, Ky. Twenty-six-inch runs from a

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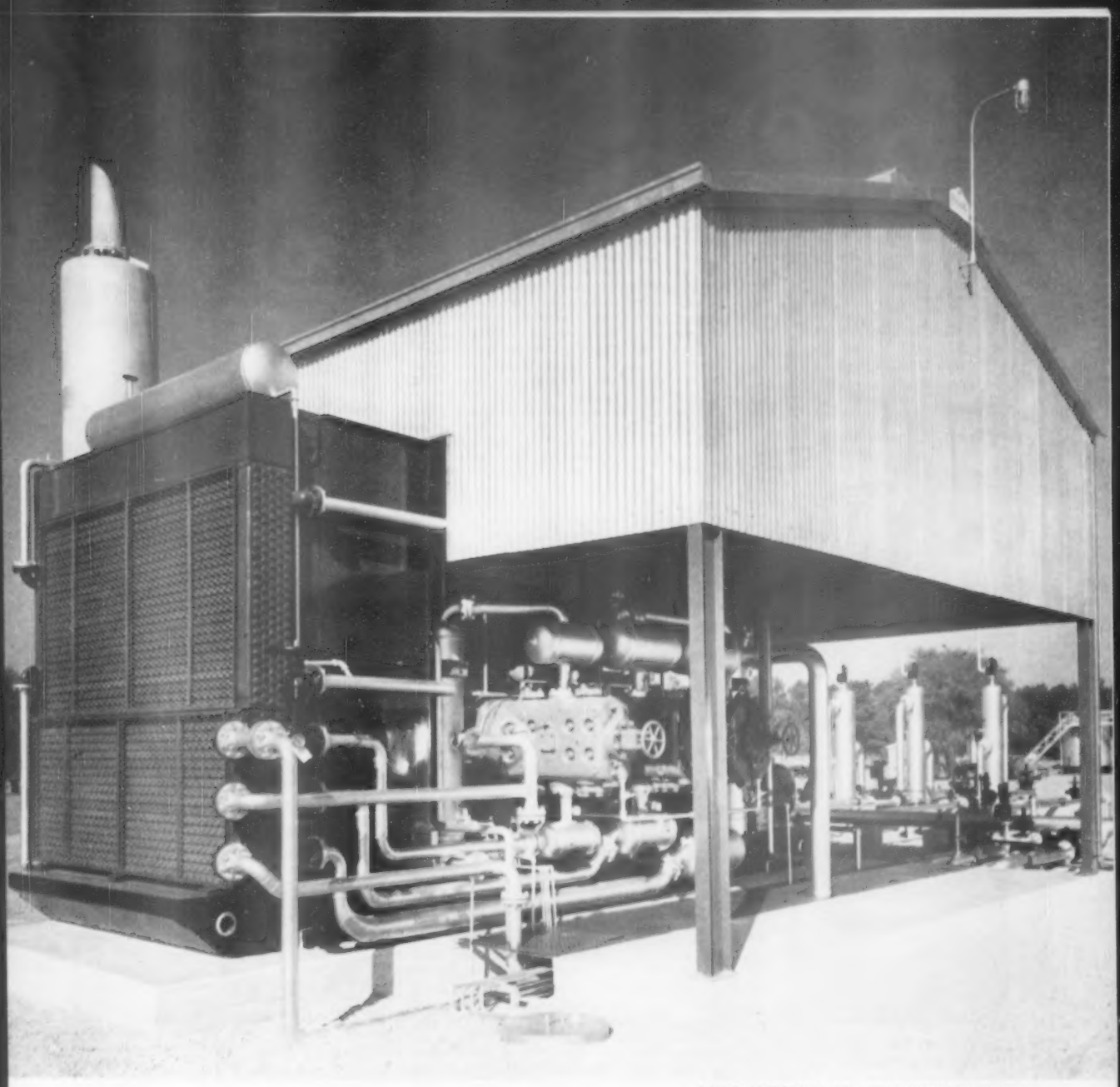

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## Pipeline Patrol

point north of the Ohio River to McConnellsville, Ohio, and from Newcomerstown, to near Lisbon, Ohio. Approved by FPC but not yet contracted. Completion set for fall of 1956.

**Project 4**—192 miles of 24-in., 34 miles of 20-in., 15 miles of 18-in., and approximately 110 miles of 4, 6, 8, 10, and 12-in. from point west of Crowley, La., looping the Bayou Sale gathering line for a distance of 74 miles to a point near the mouth of the Mississippi River. Houston Contracting Co. has about 162 miles of this, including 82 miles of 24-in. east of Jeanerette toward Leeville. Job includes 137 miles of marine work. Pipelaying started February 15.

**Project 5**—63 miles of 30-in. and 99 miles of 26-in. Thirty-inch will run from Scottsville, Ky., to Cave City, Ky., and from point southwest of Danville, Ky., to a point northeast of Danville. Twenty-six-inch will run from near Greenup, Ky., to just north of the Ohio River; from McConnellsville to near Newcomerstown and from Lisbon to Mercer, Pa. Application pending with FPC.

**Project 6**—Approximately 100 miles of 4, 6, 8, 10, and 12-in. gathering lines in the Gulf Coast area of Texas and Louisiana. Application pending with FPC.

(For news of a Tennessee subsidiary see Midwestern Gas Transmission Co.)

**Texas Eastern Transmission Co.**—Company has received FPC permission to begin converting its Little Inch line from natural gas to products service.

Company asked the FPC late in December 1955 for permission to build a 422-mile, 30-in. line from McAllen to Beaumont, Tex. The line would be used to transport imported Mexican gas. The firm also asked the FPC for permission to loop 530 miles of its 30-in. line from Kosciusko, Miss., to Uniontown, Pa. The company will also lay 45 miles of 24-in. from Provident City, Tex., to connect in Matagorda County, Texas. This would tie the Wilcox Trend Gathering System in with the extension from Mexico. The company will add 50,000 hp. in new compressor capacity and enlarge existing stations by 20,780 hp.

Company also has 110 miles of 3, 4, 6, 8, 10, and 12-in. pipe being laid in Texas, Louisiana, Arkansas, Pennsylvania, and Mississippi. Work will be completed in early 1956.

• **Texas Gas Transmission Corp.**—Company has received authority from a FPC examiner to build a 105-mile supply line extending from East Lake Palourde Gas field in Assumption Parish, Louisiana, to its system in Arkansas, Mississippi, Tennessee, Kentucky, and Indiana. The lines and additional compressor facilities totaling 19,190 hp. will cost about $20,000,000.

• **Transcontinental Gas Pipe Line Corp.**—Company has announced plans for a $35-$50-million expansion this year. Exact plans haven't been announced yet.

Has FPC spent to lay 24 miles of line to gather gas from South Bayou Mallet, Maxie, and Happytown fields of Louisiana at cost of $754,000.

Will also lay 12 miles of 16 in. to gather gas from Live Oak field in Vermilion Parish, Louisiana.

• **Trunkline Gas Co.**—Firm has applied to FPC for authority to build eight new compressor stations and 24 miles of pipeline on its transmission system to enable it to sell additional gas to Panhandle Eastern Pipe Line Co. Total capacity of the new stations would be 56,000 hp. Total cost would be $18,700,000, including $1,000,000 for gathering facilities in the Gulf Coast area. Panhandle filed for 1,600 hp. additional compressor capacity to cost $3,714,000.


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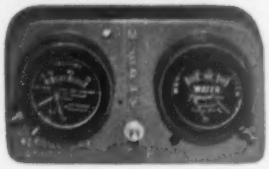

Featuring new automatic lube oil disconnect switch. Pushbutton sets lockout. Normal oil pressure automatically resets switch when engine is started.

Model W-275-D, slightly larger panel, provides space for #101-D instant snap switch for dual magneto engines.

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## Pipeline Patrol

• **United Gas Pipe Line Co.**—Firm has received Federal Power Commission authority to construct 105 miles of pipeline in Mississippi, Alabama, Georgia, and Florida. The company will also add 5,300 hp. in compressor capacity. The job will cost about $12,500,000.

• **Utah Natural Gas Co.—Planning** 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not yet let.

### Foreign Crude-Oil Pipelines

**Arabian American Oil Co.**—Firm is building a 150-mile, 21-in. line from Safaniya field to near the Neutral Zone border.

• **Cremona Pipe Line Co.—Firm has announced** plans for a 60-mile crude-oil line from the Westward Ho-Sundre area to Calgary.

• **Esso, A. G.**—West Germany affilate of Standard Oil Co. (N. J.) plans line from North Sea port to Rhur-Rhine area. This will probably be 120-mile, 10-in. from Rotterdam to Cologne, the latter rumored as the site of a new 58,000-bbl. refinery to be built by the company.

**Ganso Azul Cia de Petroleo.**—Company is building a 47-mile, 4-in. line from Agua Caliente field to Pucallpa, a port on the Ucayali River.

• **Gulf Italia Co.**—Firm is laying a 35-mile line from its Ragusa field in southwestern Sicily to a refinery at Augusta operated by RASIOM, an Italian company. The line size was not disclosed. Work is expected to be completed by the end of summer.

**Interprovincial Pipe Line Co.**—Majestic Contractors, Ltd., has contract for 67 miles of 24-in. and 2 miles of 26-in. along the company's system from Alberta to Sarnia, Ont. The Majestic work will be between Carroll and Somerset, Man., and 2 miles between the U. S. border and the Gretna pumping station. Work will be completed near the end of summer 1956.

• **Iraq Petroleum Co., Ltd.—Company is making** plans to lay a 75-mile, 24-in. products line from Homs, Syria, to Tripoli, Lebanon. The line would have a capacity of 180,000 bbl. daily.

• **Pembina Pipe Lines, Ltd.**—Company has announced proposal to build crude-oil line from Sundre-Westward Ho area of Alberta into Edmonton. Two other companies, Cremona Pipe Line Co. and Rangeland Pipeline Co. also have plans for moving the area's crude.

• **Rangeland Pipe Line Co.**—Subsidiary of Hudson's Bay Oil & Gas Co. has made proposal to build line out of Sundre-Westward Ho area to connect with a line of Texaco Exploration Co. and then go to connections with Trans Mountain and Interprovincial.

• **Sinclair Oil Corp.**—Company is considering a 240-mile crude-oil line from its San Silvestre field in the state of Barinas, Venezuela, to Puerto Cabello on the Caribbean Sea coast. The line would cost $25,000,000

**U. S. Defense Department.**—U. S. Defense

• **Standard - Vacuum Oil Co.** — Company has long-range plans for a 90-mile pipeline to give the new Lirik field in Central Sumatra an outlet. Completion is not scheduled before 1957 or 1958.

**Westspur Pipe Line Co.**—Firm has awarded contract to Majestic Contractors, Ltd., Edmonton, for 109 miles of 12-in. line from Midvale, Saskatchewan, to Interprovincial Pipe Line Co.'s pump station at Cromer, Manitoba. West spur has also let contract to same company for 50 miles of various size gathering lines in the Midale-Frobisher area of Saskatchewan.

### Foreign Products Pipelines

• **Chaco Pipeline & Refinery Corp.**—Firm plans to build 450-mile line from Glen McCarthy's wells in Bolivia to a new refinery to be built at Concepcion, Paraguay.

• **National Fuel Oil Co.**—This company in Israel is a shareholder in a company which plans to build a products line between Haifa and Tel Aviv. The plans call for a 55-mile 6-in. line in which the Government would own 10 per cent.

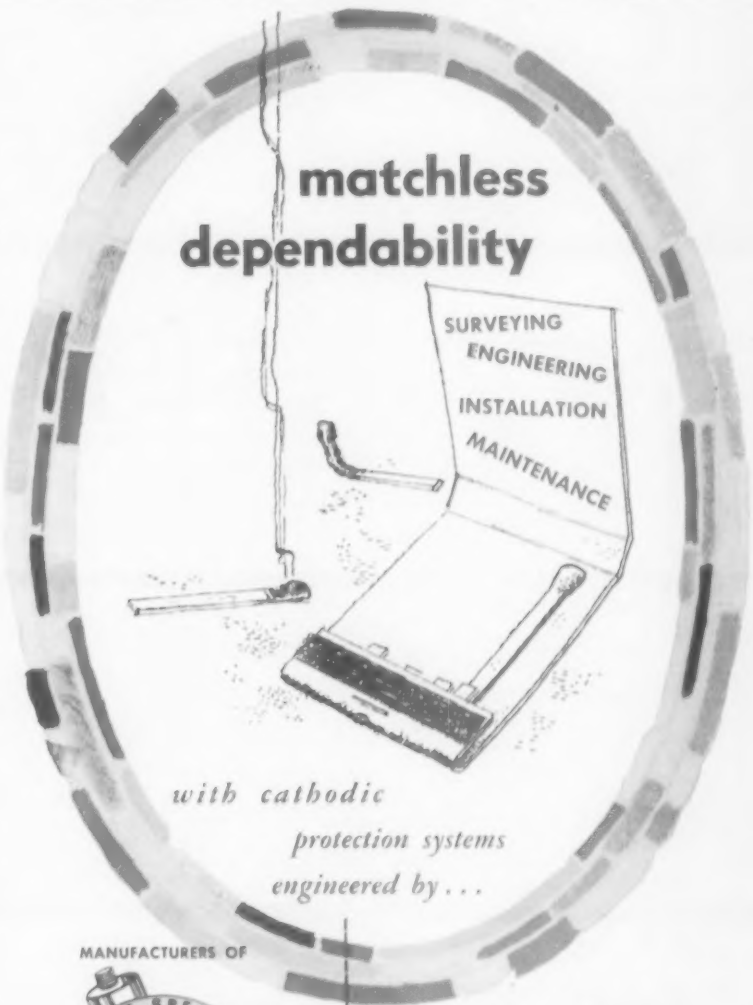
• **National Iranian Oil Co.** — Company plans $32,300,000, 573-mile, 10-in. products pipeline from Ahwaz to Teheran, Iran. The line will have a capacity of 40,000 bbl. daily. Costain-John Brown, Ltd., London, will build the 337-mile southern part. Entrepose, Paris, will build the northern 236 miles.

• **North Atlantic Treaty Organization (NATO).**—Laying products lines to airfields in various parts of Europe. About 2,000 miles of line will be laid. Bids were taken in January on 300 miles of 12-in. line between Marseille and Langres, France. Cost will be about $7,850,000.

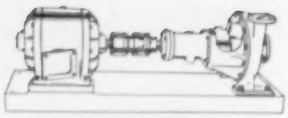
**NATO**—Associated Pipeline Contractors, Inc., Houston, is laying 450 miles of products line from Iskenderun, Turkey, to Batman, also in Turkey.

**Overland Pipeline Corp.**—This South African firm has requested government permission to build a 350-mile line, to cost $8,450,000 from the South African coast to Rand, a plateau area in southern Transvaal where there is heavy petroleum consumption.

**The United States Defense Department.**—Department is sponsoring a 485-mile, 8, 10, 12-in. products line from Cadiz to Zaragoza, Spain. The contract has been let to Merritt Chapman & Scott; Benson & Montin

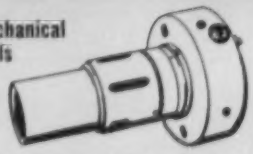
# BJ pumps for the petroleum industry



**BJ chemical pump with mechanical seal**

Fitted with special BJ Mechanical Seal which provides positive protection against leakage to bearings or contamination of the pumped liquid. Adjusting sleeve permits easy impeller adjustment without dismantling.

**mechanical seals**



Replace standard packing in stuffingboxes. Eliminate excessive leakage and frequent repacking. Recommended for corrosive, high temperature or volatile liquid pumping. Prevent contamination of pumped liquid.

**type VMT pumps**

Designed for pumping liquids from sub-zero to 750° F.—corrosive or non-corrosive—where NPSH is limited. Capacities to 5000 GPM and heads to 575 ft. Smaller "VLT" models also available in capacities to 120 gpm.

**vertical circulating pumps**

Single or multi-stage. For pumping medium to high capacities of water. Two size ranges. Capacities to 50,000 gpm. Heads to 40 feet. Saves space, simplifies piping. For cooling tower, dewatering, drainage, river-intake and circulating.

**hydropress pumps**

For medium to high pressure pumping at low capacity. Vertical construction saves space, simplifies installation. No relief valves required. Uniform non-pulsating flow. Capacities to 300 gpm. Heads to 7000 ft.

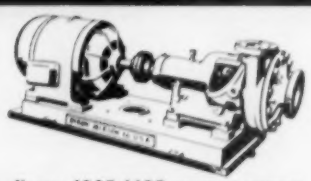
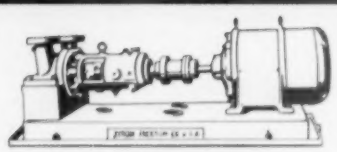


**figure 1025-1125 process pumps**

Moderately priced pumps for general-purpose handling. Available with BJ Mechanical Seal. Capacities to 2000 gpm, heads to 800 ft. Temperature limit 350° F.

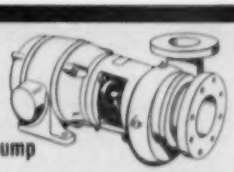


**2-stage SM process pumps**

For pumping fluids over a wide range of pressures and for temperatures up to 800° F. Ideal for pumping hot or cold liquids near their boiling point. Capacities to 2200 gpm and heads to 1600 ft.

**multiplex pumps**

Recommended for boiler feed, pipeline, debarking and all classes of medium-to-high pressure and temperature service. Easy inspection or cleaning without disturbing piping, bearings or driver.



**bilton pump**

A general-purpose, close-coupled pump and motor unit. Mounts in any position with no rigid base needed. Especially useful where space is limited. Available with BJ Mechanical Seal and explosion-proof motor. Capacities to 2000 gpm and heads to 475 ft.

**submersible pumps**

For well pumping, booster stations, or for standby service. Pump and sealed motor operate completely submerged. No pump house or surface structure needed. No well too deep. Ideal where flood menace exists. Capacities to 20,000 gpm and heads to 1800 ft.

**sumpmaster pumps**

Available in more than 3000 combinations. Recommended for cooling and circulating and for booster service. Also general sump service. Self-priming. Available in standard column lengths of 5, 10, 15 and 20 ft.—with or without outer barrel. Capacities to 2600 gpm, heads to 300 ft.

**double suction hot oil pump**

Developed for capacities beyond the range of single suction process pumps. Designed to handle high temperature liquids on continuous service operation. Rotating element can be removed as a unit without disturbing the piping or driver. Capacity range from 1000 to 7000 gpm, heads from 100 to 700 feet. Construction materials to suit application.

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## Pipeline Patrol

of Oklahoma City; and Agroman Construction Co., a Spanish firm. Brown-Raymond-Walsh is the prime contractor. Cost of the line will be approximately $5,000,000.

**Winnipeg & Central Gas Co.**—Canadian company plans to build a $20 million butane-propane system. Company plans to get gas L.P.G. from Signal Oil & Gas Co.'s Tioga, N. D., plant and move it to Winnipeg. Size and route of the line has not been definitely established.

### Foreign Natural-Gas Pipelines

• **Alberta Gas Trunk Line Co.**—Company will spend $47,000,000 to build 547 miles of gas-gathering system for the Trans-Canada line. The 1956 stage of construction will total 219 miles and cost $22,650,000. The first part would start near Saskatchewan and include Pincher Junction, Provost, Bindloss, Sibbald, Oyen, Sunnynook, Steveville, and Cessford. The second part to be built in 1957 will consist of 328 miles and cost $24,400,000. The second phase will include Countess, Duchess, Princess, Homglen-Rimbey, and Nevis.

**Attock Oil Co.**—Company plans to build 60-mile natural gas pipeline from Dhulia field to Rawalpindi in West Pakaistan.

**Cia. Shell de Venezuela.**—Company has announced plans for a $21,000,000, 177-mile, 20-in. natural-gas line from La Paz field in the Maracaibo district to the Cardon refinery on Paraguana Peninsula. The gas will be used as the chief fuel in the refiner's furnaces. The line is expected to go into operation in 1957.

• **Empresa Nacional del Petroleo.**—80 miles, 10-in., planned. Concon to Santiago, Chile.

• **Gas Industrial de Monterrey.**—Company has announced plans for a 22-in., 130-mile natural-gas line from Reynosa to Monterrey in northern Mexico. The project will parallel a 14-in. line which has been supplying Monterrey since 1947.

**Imperial Oil, Ltd.**—This Canadian firm has let contract for 65 miles of 4 to 16-in. gas-gathering system in the Redwater area of Alberta.

• **Magna Pipeline Co.**—Firm has plans to build a $6,000,000 underwater line from Anacortes or Bellingham in Washington to Victoria. The line is expected to be completed by the fall of this year.

**North Canadian Oils, Ltd.**—Dutton-Williams Brothers, Ltd., of Edmonton, has contract for 136 miles of 10-in. line from Wabumun to Hinton, Alta. Mid-Western Industrial Gas, Ltd., which will supply gas along with North Canadian to a pulp mill at Hinton, will build a line from its gas fields in the Alexander, Majeka Lake, and Westlock districts to Wabumun.

**South Alberta Pipe Line, Ltd.**—Company has filed permit to construct a 150-mile, 8-in. natural-gas line from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta. The line will cost about $1,000,000.

• **Sui Gas Transmission Co.**—Pakistan Constructors, a joint company of Morrison-Knudsen, Boise, Idaho, and William Press Ltd., London, have contract to build a 188-mile, 16-in. line from Sui gas field to Multan, Pakistan. Work will begin in mid-1956. The line will later be extended to Lahore with branches at Kot Addu, Jhang, Magiana and Montgomery.

**Westcoast Transmission Co., Ltd.**—Company is starting work on a 650-mile, 30-in. line from the Peace River area in Canada to Sumas, Wash. Contractors are Mannix, Ltd., Canadian Bechtel, Ltd., R. A. Conyes Construction Co., and Dutton-Williams Brothers Co., Ltd. Cost to be about $120,000,000.


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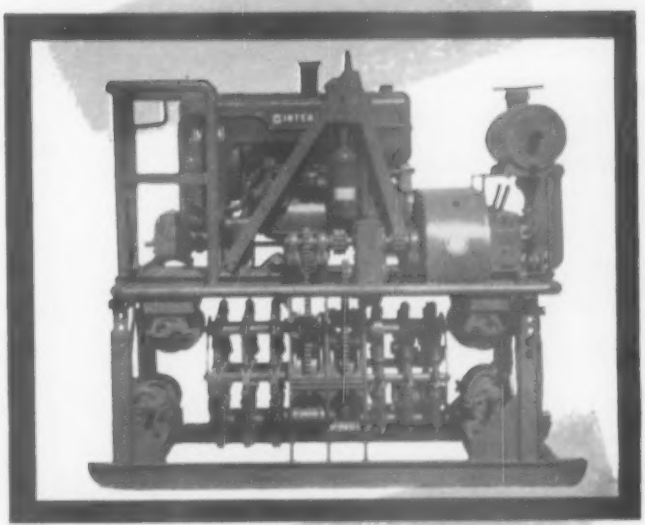

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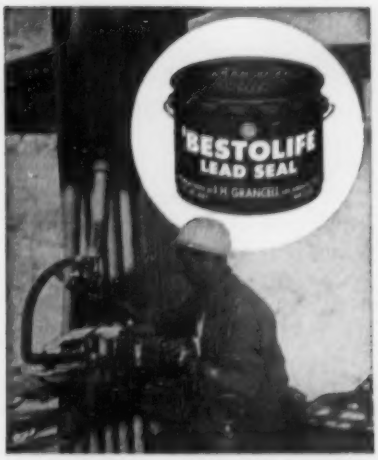


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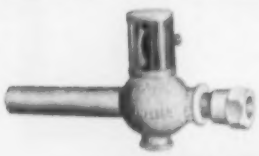

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# Among the Drilling Contractors

## Former Pike Executives Operating in New Firms

Two new drilling contracting firms are operating on the Pacific Coast as an outgrowth of the recent acquisition of the Pike interests in Thomas P. Pike Drilling Co., of Los Angeles, by Republic Supply Co. of California.

The newer firm is Graham Drilling Co., headed by Gene Graham, formerly executive vice president and director of the Pike company. It is starting with three rigs, with depth ratings ranging from 3,000 to 10,000 ft. It has access to two additional rigs if needed.

Previously announced was the formation of Haney & Williams Drilling Co. by Stanwood I. Williams and H. G. Haney, former president and vice president, respectively, of the Pike company.

Its initial contracts include a 10,500-ft. wildcat test for Geochemical Surveys, Inc., 20 miles east of Kettleman Hills field, upper San Joaquin Valley, and Monterey Oil Co.'s second test on its State Lease 1549 at West Newport, Orange County, California.

Headquarters of both companies are in Los Angeles.

The Pike company, which has been one of the most active contracting firms on the Pacific Coast, has quit business with completion of all its commitments. Republic Supply Co. of California, in which the Pike family holds substantial interests, has made known it will not engage in the drilling business wth the rigs it acquired from the contracting company.

**Woolf & Magee,** Tyler, Tex., have a rig working for Warren Petroleum Corp. at a wildcat location 3 miles northwest of Arkana, in southern Lafayette County, Arkansas. It is a 6,100-ft. Mitchell-sand test at 1 Maryman, in 32-19s-25w. Location is about 2¾ miles northeast of Mitchell-sand production in West Bradley field. It is

**Representative types of light rigs being used by contractors in the intense drilling campaign in Osage County, northern Oklahoma. Most common is the small skid-mounted rig (left) with jackknife derrick. At right, is a heavy-duty, truck-mounted shot-hole rig, a type coming into increasing use. With the latter, contractors use a pull-down and drill collars. Along the east side of the county, operators are developing production from the Mississippi chat which comes in about 2,000 ft. Most rigs are in the White Tail area just north of Pawhuska.**

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about 4 miles southwest of Bradley townsite.

**Dillard & Waltermire Drilling Co.,** Houston, is contractor on Shell Oil Co.'s deep wildcat test 12 miles southwest of Belton, in Bell County, South Central Texas. The well, 1 Massie, in the William Leftwich Survey, is projected to 8,500 ft.

**Kirkwood & Morgan,** San Antonio, have a new contract operation in La-Salle County, Southwest Texas. It is a 5,500-ft. test for L. M. Lockhart at 1 Cartwright, in the H&GN Survey 162, about 4 miles southwest of White Kitchen field.

**Barnes Core Drilling Co.,** Bakersfield, Calif., has taken a contract for a 4,500-ft. test to be drilled for Arthur Fisher, of Los Angeles, at a wildcat location 4 miles north of Lost Hills, in northwestern Kern County, California. The test will be drilled as 1 Frants-Schatz, with location in 14-26-21.

**Montgomery Drilling Co.,** El Dorado, Ark., has a new wildcat operation 2½ miles southeast of Lewisville, in Lafayette County, Arkansas. It is a 5,500-ft. Travis Peak test for Don D. Montgomery, one of the owners of the contracting company, and his associates. Location is at 1 Griffin, in 35-16s-24w, about 2 miles from production.

**South States Drilling Co.** is drilling at two new locations in Cass County, northeast Texas. Both are contract jobs, one being for F. R. Jackson in the Haynes area, 5½ miles east of Kildare, and the other for S. H. Killingsworth in Kildare field, 2½ miles south of Kildare. The first is a 7,000-ft. Pettet test, an outpost, at 1 Morse, in the James Taylor Survey. The other, at 2 Davis, in the B. W. Hopson Survey, is a 6,800-ft. Pettet test.

**Clinch Drilling Co.,** Jackson, Miss., has a new wildcat operation under way for Serio-Punches Oil Co. in Wilkinson County, southwestern Mississippi. It is a 7,900-ft. Wilcox test at 1-A Stricker, in 13-3n-4w. Location is about 2½ miles northeast of Lake Mary field.

**Jett Drilling Co.,** Shreveport, is under contract for a 9,400-ft. test to be drilled on the east bank of Mississippi River, in Jefferson County, Mississippi. It will attempt to extend production of Rodney field, located just across the river in Tensas Parish, Louisiana. The test is for Midstates Oil Corp., with G. H. Jett, of the contracting company, as joint operator.


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# Showcase

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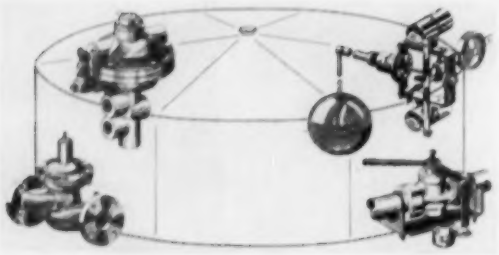
**by Dan B. Miller**



## Tank System Powered by Lease Gas

Auto-Switch for tank batteries is a pneumatic tank-switching system powered by lease gas. Auto-Switch handles many daily lease routines now performed by pumpers. Each tank is equipped with a relay which responds to an internal tank float to open and close the fill valve.

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●

## Tube Expander Features Three Operational Firsts

A new tube-expander drive called the Torq-Air-Matic, incorporates three firsts. It is the first all-air driven tube-expander drive, the first to offer a control entirely free from the effect of operating variables and maintenance problems, and the first to provide a control with torque output calibrated in terms of foot-pounds instead of arbitrary units of measurement.

The Torq-Air-Matic method of registering torque at the output spindle prevents tubes from being over-rolled or under-rolled. The readings are precise and consistent regardless of tube-sheet-hole variations. This control feature also eliminates overstressing of tube

sheets, reduces warpage and ligament pushover. Tube bowing is held to absolute minimum.

The Torq-Air-Matic is an all-air rotating-type control. It will produce 14-ft.-lb. torque at 90 psi. with maximum consumption of 12 c.f.m. of air. It is completely self-contained, which eliminates the need of separate control cabinets, cables, and other connections. The only connection required is the operating air hose.

This tool accurately controls tube expansion by directly measuring torque output at the output spindle right at the mandrel for maximum convenience and efficiency. Oil reservoir has been built into the handle. Control section is independent of the motor, and lubrication is permanent. The chuck snaps on. The total weight with the auxiliary handle is approximately 7½ lb., and the length is 10 in. **For more information write or call: Thomas C. Wilson, Inc., 21-11 Forty-fourth Avenue, Long Island City, N. Y.**

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OIL AND GAS JOURNAL **Showcase Coupon**

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**Described in the Feb. 20, 1956 issue of The Oil and Gas Journal**

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**DATE** _____

## Klustrite Method Offers Better Rotary Shoe

A new development in the field of wash-over cutting equipment is the Klustrite rotary shoe. Carbide slugs are first fractured into jagged fragments of ⅛ to ¼ in. in cross section. These fragments are then interspersed into a suitable matrix on the shoe in a varied pattern.

The small fragments are supported on all sides by the matrix or bonding material which has sufficient resiliency to allow movement of the carbide particles under impact, serving as a sort of shock absorber, and yet which is tough enough to withstand severe loading.

In the Klustrite method, however, an infinite number of cutting edges are available. When one edge dulls, another takes over, causing the efficiency of the shoe to remain constant throughout the operation.

Some outstanding field runs have been reported. Near Harvey, La., two Klustrite shoes were used in washing over junk in the hole which consisted of one 9¼-in. o.d. conventional-type rotary shoe, a piece of box tap, part of a die nipple, a 4-ft. slab of 10¾-in. casing, and four sets of outside cutting knives. This junk was accumulated around the drill pipe over a 9-ft. section of the hole. During a period of 36 hours, this junk was burned up and an additional 10 ft. of hole was made. The first Klustrite shoe was in the hole 26 hours and showed considerable wear. The second shoe drilled for 10 hours and appeared to be as good as new. **For more information write or call: Houston Oil Field Material Co., 1525 Maury Street, Houston, Tex.**

●

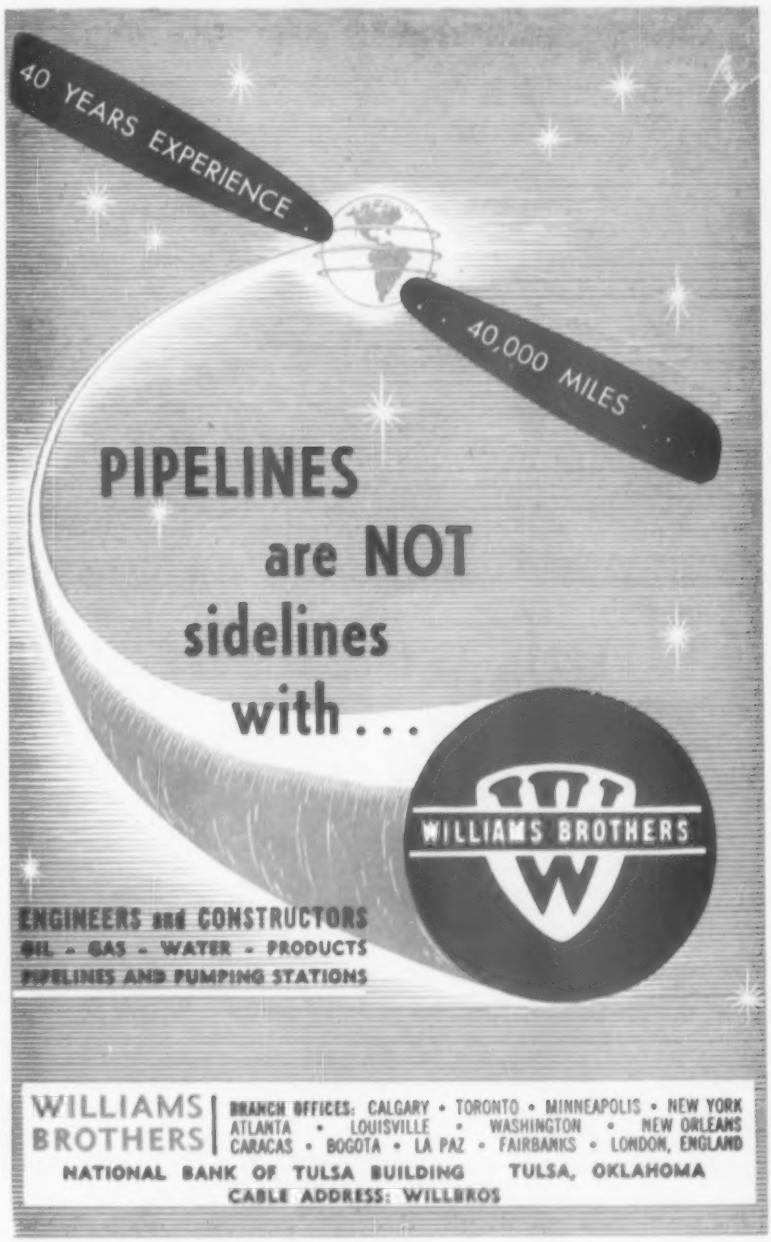
## Automatic Sampler Operates Entirely From Line Flow

Operating entirely from the line flow, the Mepco sampler is designed to take a constant accurate sample in direct proportion to the rate of flow of any type liquid. It is ideal for sampling crude oil and crude-oil products and for use in automatic-custody-transfer units.

Power for unit is provided by the fluid in the line through an impeller located in a weld tee which is either welded or flanged into line. Revolutions per minute of the impeller are governed by the volume of fluid passing through the line, and actual tests have proven that impeller speed increases or decreases in direct ratio with increase or decrease of fluid volume.

Actual sample is taken through a four-way rotary valve and a piston-type regulator control valve. Four samples are taken on each revolution of the four-way valve and amount of sample taken can be varied from a minimum of 1 qt. to 50 gal. in 24 hours by adjustment of plunger stroke. Sampler is available for installation in lines 2 through 36 in.

Vaporproof container, available in 1, 2, and 5-gal. sizes, is constructed in two halves: bottom aluminum and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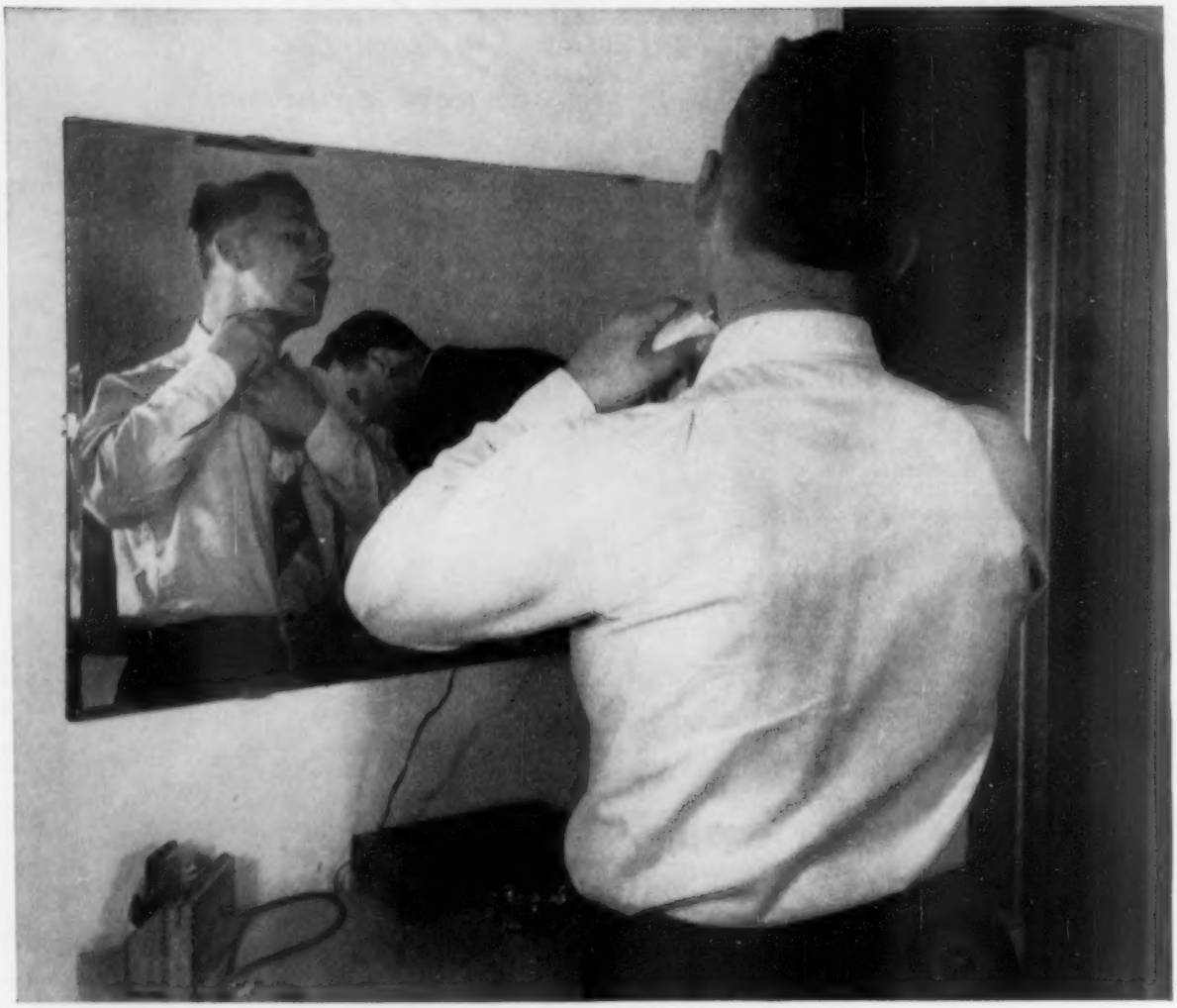
CABLE ADDRESS: WILLBROS



# "Think we ought to give the job to Pritchard again?"

"Listen, Mike, it's awful early in the morning and I haven't had coffee yet."

"That isn't a complicated question. What do you think?"

"Seriously, Mike. It's an unqualified 'yes'!"

"That's the way I feel about it. Better hurry and get that suitcase packed if we're going to catch that train."

"Then, too, they're a nice outift to work with."

"Right."

"And I like their package contract—responsibility for everything—engineering, design, drafting, construction."

"Right."

"And so I think it's Pritchard again."

"You left out the big thing. They've already built a compressor station for us with three gas turbine compressor units. 34,200 horsepower. Built at less than $250 per horsepower!"

"I'll let the Pritchard folks know our decision as soon as we get back to the office."

**J. F. PRITCHARD & CO.**
4625 Roanoke Parkway, Kansas City 12, Mo.

"Think we ought to give the job to Pritchard again?"

**PRITCHARD KNOWS HOW TO GET A JOB DONE RIGHT... RIGHT ON TIME!**

Time after time natural gas companies that have had any experience at all with the Pritchard organization have come back for more when they expanded or modernized.

Why?

Because Pritchard knows how to get the job done right, right on time.

And, Pritchard's complete package contract means that each part of planning and installation is done on a carefully co-ordinated engineering, purchasing and construction schedule.

Pritchard is ready to offer you the same type of high caliber planning!

**WRITE FOR PROOF!**

Write today for a typical example of how you save time and money with Pritchard's complete package contract.

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ENGINEERS • CONSTRUCTORS
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Kansas City 12, Missouri

top clear plastic to observe amount of sample collected. An OR-15 Hycar diaphragm prevents the escape of any vapors. Entire unit can be cleaned and reassembled in a few minutes. Available with stand and hood or installed in a sheet-metal housing bolted to sampler body. **For more information write or call: McFarland Engineering & Pump Co., Inc., 1206 Nance Street, Houston 2, Tex.**

•

## Partitioner Utilizes New Method in Gas Analysis

The Fisher-Gulf Partitioner makes an automatic qualitative and quantitative analysis of gases and volatile liquids by the powerful new method, gas-liquid partition chromatography.

The Fisher-Gulf Partitioner uses a 14-ft. thermostatted chromatographic column to resolve each mixture into its pure components. Each compound is indicated as a separate peak in a spectrum. A builtin integrator simultaneously computes and records a number proportional to the quantity of the component making the peak.

The unit was developed for analysis of petroleum and petrochemicals by specialists in Gulf Research & Development Co. and in Fisher Scientific's research and development laboratories.

In gas-liquid partition chromatography, an inert gas such as helium sweeps the sample through a column filled with an inert packing, coated


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**KENNAMETAL* BALL AND SEAT stays down longer...**

**keeps production profits up**

Matched pairs of Kennametal Balls and Seats stay on the job from 3 to 5 times longer than "special" or super alloys, even under the most severe conditions of impact, corrosion and abrasion. More oil moves up . . . and faster, with fewer pump pulls, less well downtime.

Two grades of Kennametal Balls are available. Grade KH is for use under high abrasive cutting conditions. Grade 162B, or Kentanium*, where severe case wear and seat impact are met. The latter, being 1/3 lighter than steel, greatly reduces ball-on-seat shock.

Both grades of Kennametal Balls give exceptionally good service under conditions of severe fluid abrasion, ball pounding, and chemical and electrolytic corrosion.

For additional information and reports of performance, see your regular supplier, or write to KENNAMETAL INC., Latrobe, Pennsylvania.

**Precision Manufactured to API Specifications**

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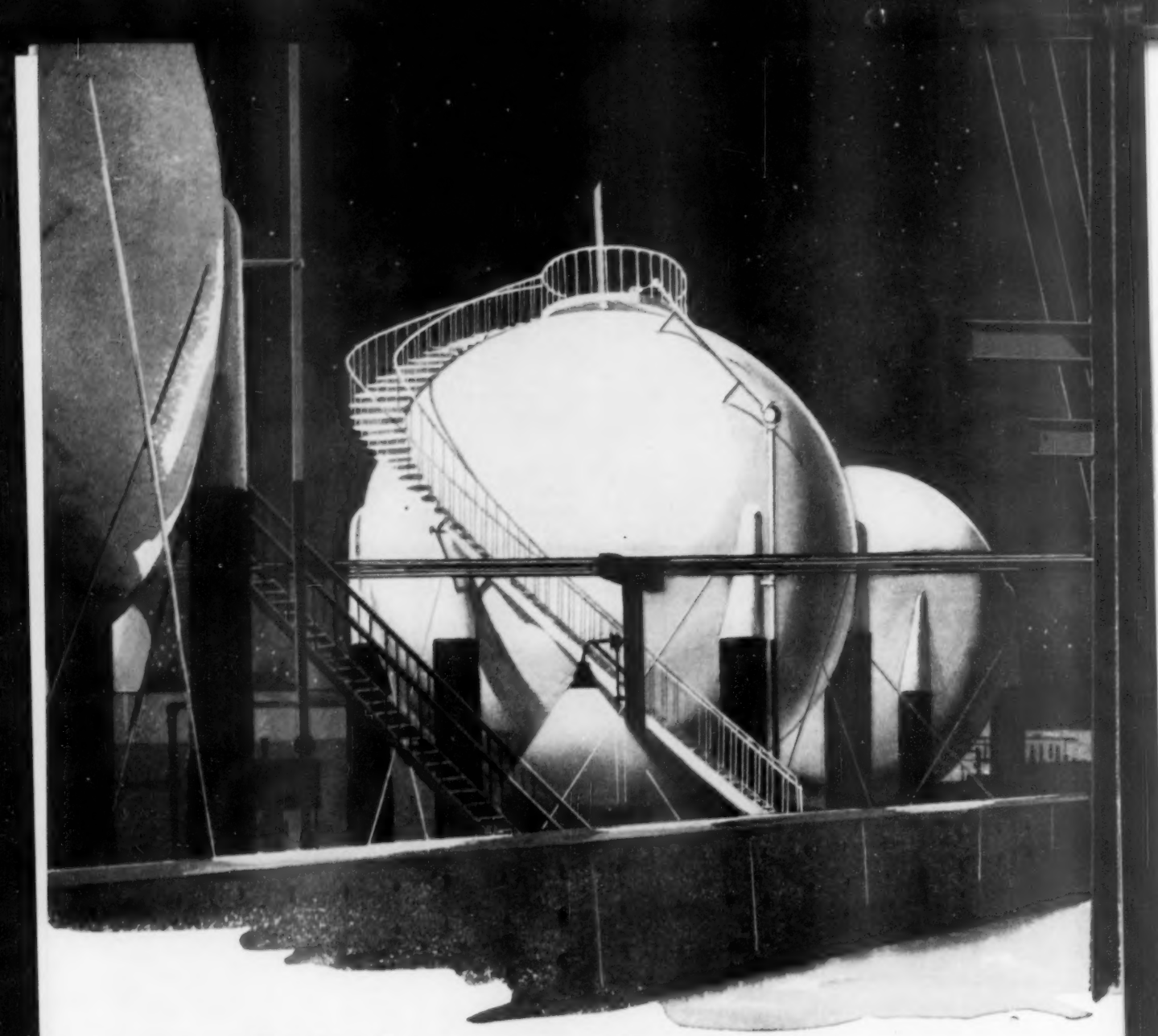
INDUSTRY AND KENNAMETAL ...Partners in Progress

***Longer* pump life, *less* downtime, *lower* pump cost**



# Petroleum Products...

## and Beacon Petroleum Company

The successful marketing of today's petroleum products depends upon an experienced organization. Behind Beacon are years of successful operation... your assurance of dependable service.

If you have Butane-Propane, Deisel Fuel, Natural Gasoline or any other petroleum products to sell contact Beacon . . . or if you want to buy any petroleum products . . . contact Beacon.

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**MARKETERS OF NATURAL GASOLINE, BUTANE-PROPANE, MOTOR FUEL, FUEL OILS**

with a high-boiling absorbing liquid. Different components travel at different rates and become separated. As they emerge, they are detected by a thermal-conductivity cell, producing a peak on a recorder chart. The area under each peak is proportional to the mole fraction of that component in the sample. The Partitioner integrates this area automatically, shows it as a series of pipes at the bottom of the chart. **For more information write or call: Fisher Scientific Co., 381 Fisher Building, Pittsburgh 19, Pa.**

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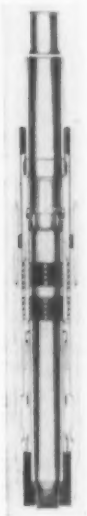
## Collets Lock Landing-Nipple Packer in Place



A new landing-nipple casing packer seats in a landing nipple made up in the casing string, in much the same manner as other Otis subsurface production tools are landed in tubing.

This selective collet-type casing packer is a retrievable tubing-to-casing pack-off tool which can be run, set, and pulled on the tubing string or a sand line. The assembly consists of the casing landing nipple, a packer body, a seal-nipple assembly, and a locator assembly for the packer body. Tubing weight is not necessary to set the packer, nor is rotation necessary to seat or unseat the tool. Heavy-duty collets lock the packer securely in position and no slips are used which might damage the casing wall or become corroded. The packer is capable of withstanding extremely high pressures both from above or below. **For more information write or call: Otis Pressure Control, Inc., 6612 Denton Drive, P. O. Box 7206, Dallas, Tex.**

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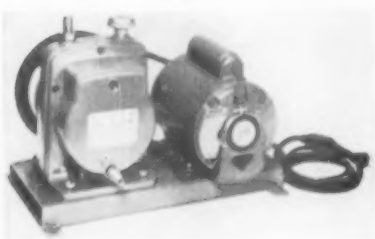


## Hyvac 2 Delivers Free Air At 20 Liters Per Minute

A completely new high-vacuum pump, called the Hyvac 2, is an addition to the company's line of Hyvac pumps and delivers a free air displacement of 20 liters per minute, twice that of the Hyvac.

Practically vibrationless and noiseless, the Hyvac is capable of pumping from atmospheric to ultimate pressure in approximately 5 minutes and delivers a guaranteed ultimate vacuum of 0.1 micron.

The new pump is also more compact than former models. The pump and motor together measure only 10 by 15 in. over-all, with a height of 11 in. The mounting-base size is only 7 by 15 in. Other features of the Hyvac 2 include: an easy-view oil-level window; fast and convenient oil drain; and machined cast-iron pulleys, individually balanced. **For more information write or call: Central Scientific Co., 1700 Irving Park Road, Chicago, Ill.**

OIL AND GAS JOURNAL Showcase
.....OF NEW EQUIPMENT


THE EMBLEM OF QUALITY

...serving millions of motorists at over 19,000 service stations.

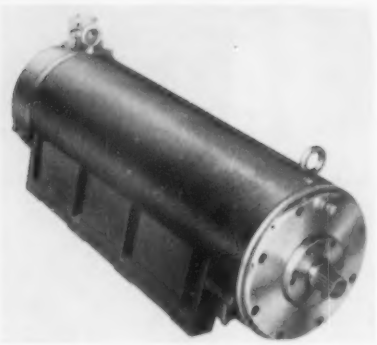
A complete line of highest quality petroleum products for automotive, industry, farm and home use.

# OIL AND GAS JOURNAL Showcase
## .....OF NEW EQUIPMENT

### Mechanical-Drive Motor Is Nearly Maintenance-Free

A new moisture, dust, and explosionproof electric motor for mechanical-drive applications was especially developed for applications where it is necessary to operate electric motors in explosive or corrosive atmospheres. A full line of these mechanical drive motors is available in models and sizes to meet a broad range of requirements from 20 to 450 hp.

Since the entire motor is enclosed in a steel case filled with medicinally pure mineral oil of high dielectric strength, there is no opportunity for sparking or for corrosive attack on internal motor parts. The mineral oil, in addition to being an excellent insulator, has proven to be the best possible natural lubricant, making the motor virtually maintenance-free.



This oil-filled motor can be supplied to meet special torque requirements of particular applications as well as special horsepower and speed requirements. It can also be designed for the most advantageous mounting and provided, when necessary, with special shaft extensions to give the best adaptation to the driven equipment. Terminal boxes can also be supplied for use with the special power cable which may be required for a specific installation.

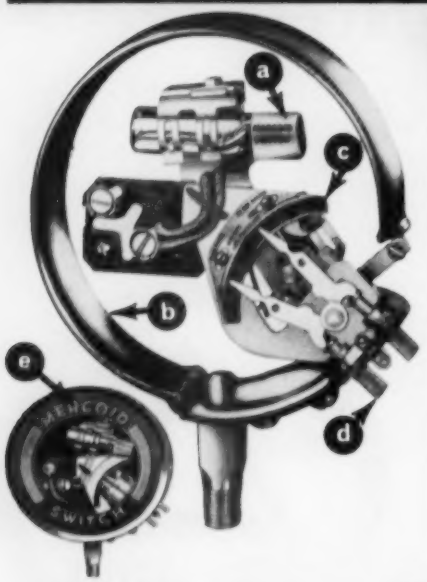
All motors come equipped with mechanical seals which replace the standard packing in the stuffing box, eliminating the cost and trouble of repacking. **For more information write or call: Byron Jackson Pumps, P. O. Box 2017A, Terminal Annex, Los Angeles 54, Calif.**

•

### Chain Repair Anvil in Two Sizes Repairs Six Sizes

A new chain repair anvil is made to be used with standard inexpensive cold shuts. The three-lobed anvil is designed so that each lobe accommodates a different chain size covering the range most suited for the service. Thus, for drilling rigs the lobes are for ¼, ⅜, and ⅜-in. chain. For trucks, the lobes fit ⅜, 7/16, and ½-in. chain, respectively.


**Will the controls you specify provide safe, dependable operation today, tomorrow or a year from now?**




*to be sure, specify*

**MERCOID®**
**Series "D"**
**PRESSURE & TEMPERATURE CONTROLS**

*Backed by over thirty years of field experience.*

*Over a million in use throughout every industry in the world, safeguarding costly equipment against dangerously low or high pressure and temperature conditions.*

*Check the features and you'll see why Mercoid Controls outperform and outlast ordinary types.*

**a— HERMETICALLY SEALED CONTACT**
*Always dependable—whether it operates once per year or several times per minute. It remains operative at all times because dust, dirt, grease or moisture cannot contaminate the contacting elements. There can be no sticking or welding of the contact points.*

**b— BOURDON TUBE OPERATED**

**c— VISIBLE CALIBRATED DIAL**
*No guesswork or calculations are required—the pointers indicate on an accurately calibrated dial, the exact operating pressures or temperature.*

**d— OUTSIDE ADJUSTMENTS**
*Independent outside adjustments are provided for setting both the cut-in and cut-out points. Differential may be widened as desired. No tools are required.*

**e— VISIBLE OPERATION**
*You can tell at a glance whether switch circuit is on or off.*

**UNDERWRITERS' APPROVED**
*All operating ranges for Series DA-21, DA-35 and DA-55.*

*Available for general use, outdoor use or hazardous locations.*

**WRITE FOR BULLETIN 48**
**THE MERCOID CORPORATION**
**4201 BELMONT AVENUE, CHICAGO 41, ILLINOIS**

To repair a chain or attach a grab hook, the cold shut is inserted in the proper size groove in the top of the anvil and then the tine is driven down through the eye. The next step is to insert the cold shut in the end of the same leg. This holds the tine vertical for peening to prevent it pulling back through the eye. The anvil is equally useful when welding the tine to the eye. **For more information write or call: Pioneer Specialties, Inc., 418 Hogan Street, Houston, Tex.**

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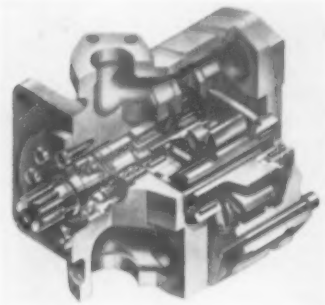


## High Volume, Pressure Pumps Are for Heavy Duty

A new series of 150 hp., 1,500 psi. hydraulic pumps for heavy mobile and industrial equipment are especially engineered for installations where space is extremely limited and where adverse conditions exist.

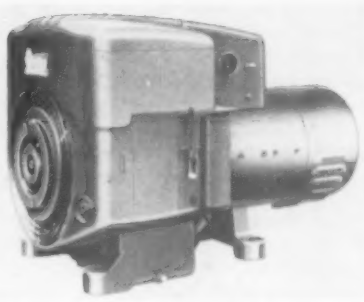
The new pumps will deliver 65, 90, and 110 g.p.m. at 1,200 r.p.m., depending on the model. Speeds range to 2,000 r.p.m., pressures to 1,500 psi., and fluid horsepower to 150. Companion control valves have also been designed for the new high-volume series.

Extensive field tests on a wide range of equipment have been run over the past 2 years and results show between 75 and 85 per cent reduction in pump and accessory maintenance, compared to similar equipment. **For more information write or call: New York Air Brake Co., 1100 East 222nd Street, Cleveland 17, Ohio.**

●

## Two New Generators Ideal For Limited Space Use

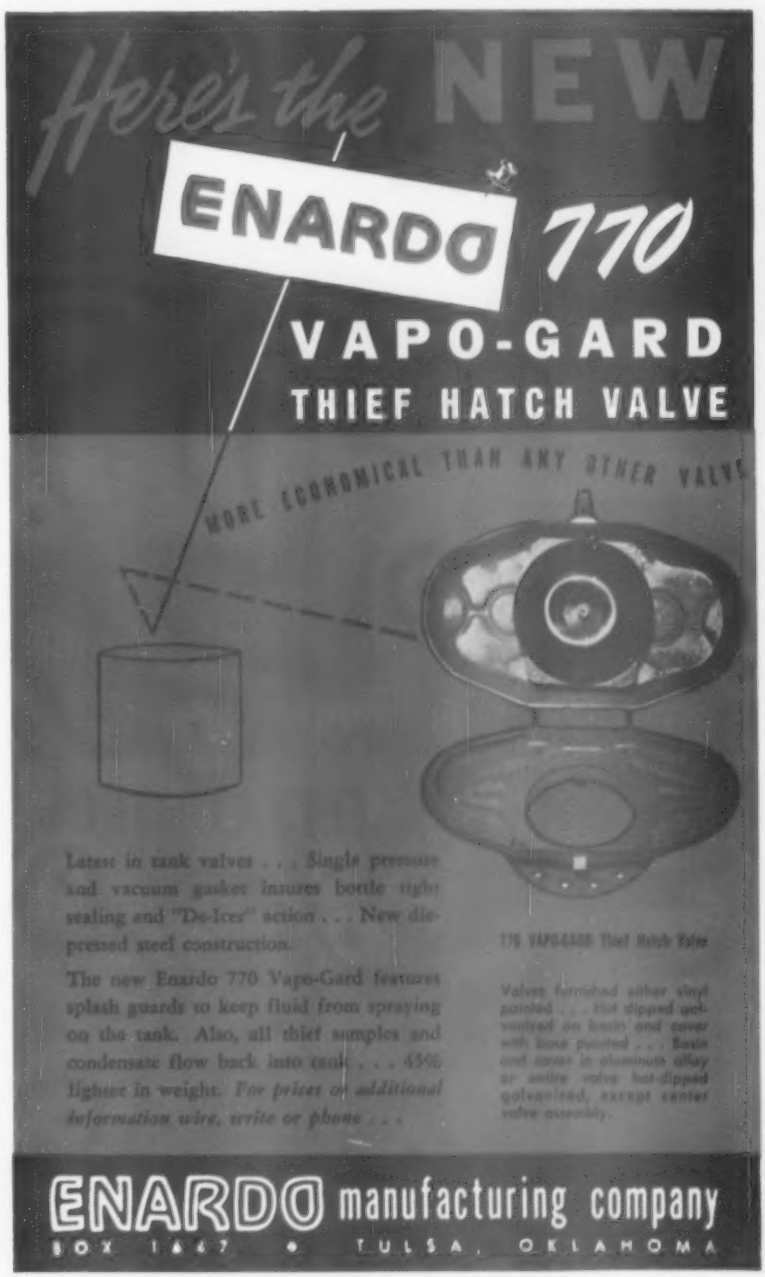
Two new electric generating plants, in 3,500 and 5,000-watt-a.c. sizes, are Models 305CCK and 5CCK. Both models are powered by a two-cylinder gasoline engine. The remote-starting model, 305CCK, is 26⅜ in. long (Model 5CCK is only 29⅞ in. long); width: 21⅜ in., and height: 20¾ in. is the same for both models. The opposed-cylinder design of this four-cycle, air-cooled engine makes the generating



plants ideal where installation space is at a premium.

Both of these two generating plant series are available in 60 or 50-cycle; 115, 230, or 115/230-volt, single phase, and 230-volt, three-phase, three-wire. There is a choice of standard remote control, portable or manual-starting models. Fuel consumption for Model 305CCK is a low 0.19 gal. per kw.-hr. at full rated load. **For more information write or call: D. W. Onan & Sons, Inc., 2515 University, S. E., Minneapolis, Minn.**

OIL and GAS JOURNAL Showcase OF NEW EQUIPMENT



Here's the NEW
ENARDO 770
VAPO-GARD
THIEF HATCH VALVE
MORE ECONOMICAL THAN ANY OTHER VALVE
Latest in tank valves . . . Single pressure and vacuum gasket insures bottle tight sealing and "De-Icer" action . . . New die-pressed steel construction.
The new Enardo 770 Vapo-Gard features splash guards to keep fluid from spraying on the tank. Also, all thief samples and condensate flow back into tank . . . 45% lighter in weight. For prices or additional information wire, write or phone . . .
770 VAPO-GARD Thief Hatch Valve
Valves furnished either vinyl pointed . . . Hot dipped galvanized on basin and cover with lines pointed . . . Basin and cover in aluminum alloy or entire valve hot-dipped galvanized, except center valve assembly.
ENARDO manufacturing company
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OIL AND GAS JOURNAL *Showcase* OF NEW EQUIPMENT

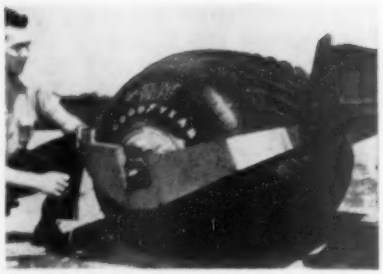
## Rubber Fuel Container Can Roll or Float With Job

A watermelon-shaped rubber tank, called the Rolli-Tanker, can be rolled over ground, floated in water, and dropped without bursting.

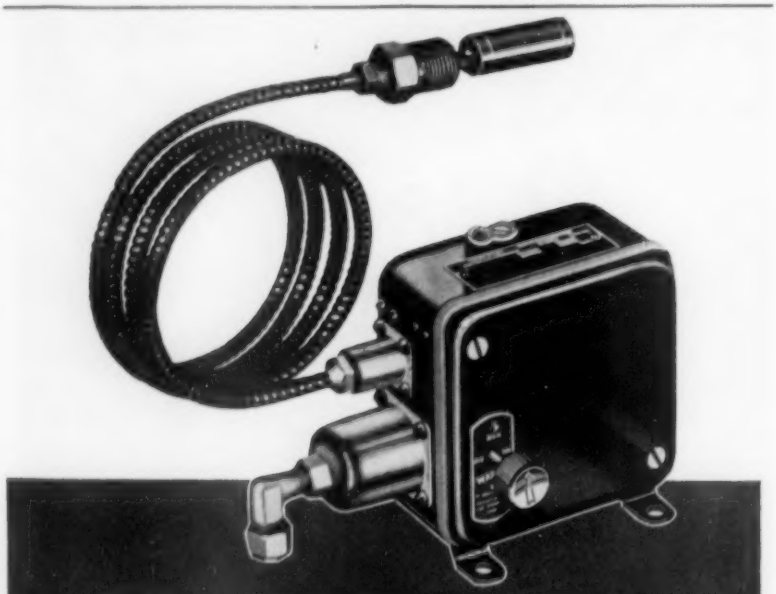
Rolli-Tankers are unconventionally shaped tires of nylon cord and tread stock construction with fuelproof inner lining. They can be built in a range of sizes. To date the company has tested 3½ by 5-ft. tanks that weigh 40 lb. deflated and give the appearance of oversized watermelons when loaded to 250-gal. capacity.

Mounted on hubs and axels to permit easy handling, Rolli-Tankers may be towed manually or by vehicle. The containers have excellent flotation characteristics because of extremely low ground-bearing pressure. Only 30 lb. of drawbar pull are needed to roll the storage units.

Filled Rolli-Tankers can be towed either singly or in tandem arrangements behind any vehicle equipped with a trailer hitch without affecting the vehicle's gross weight. Low footprint



pressures permit them to be easily drawn over unprepared surfaces, such as rocky, uneven terrain, swampy soil, and sandy area. The pliable construction of the tankers conform to the shape of obstacles over which they pass. **For more information write or call: Goodyear Tire & Rubber Co., Aviation Products Division, Akron 16, Ohio.**

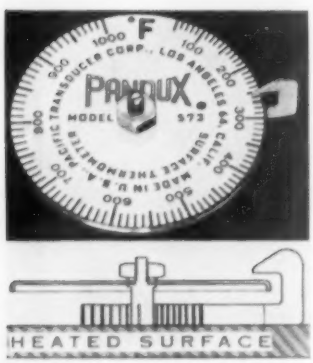
**The difference between costly engine breakdowns and minor repairs...**

# PENN ENGINE SAFETY CONTROL

Engine breakdowns can be troublesome—troublesome in costly production delays and major repairs on your expensive engines. But this won't happen with Penn on the job. In case of low lubricating oil pressure or overheated cooling water, the Penn engine safety control steps in. An alarm sounds, a light signals or the engine shuts down—whichever you prefer. Then you can discover and correct the condition before damage can develop. Ask your engine supplier for Penn Safety Controls.

**PENN CONTROLS, INC.** Goshen, Indiana

Automatic Controls For Heating, Refrigeration, Air Conditioning, Gas Appliances, Pumps, Air Compressors, Engines


## Surface Thermometer Is Easily Read, Fast Working

A new spot-check surface thermometer is made entirely of stainless steel, with a range of from 50° to 1,000° F. It is easy to ready; it is compact and very fast-operating. Merely lay the instrument on the surface to be checked. Within 60 seconds the thermometer will reach stability, and exact temperature can be easily read. It reads accurately temperatures of all surfaces, such as heavy sheet metal, furnace skins, boilers, or large superheated steam pipes. Besides the surface temperatures, it also reads ambient temperatures in furnaces, ovens, and other enclosed spaces, as well as in noncorrosive liquids and gases, up to 1,000° F.

The spot-check surface thermometer comes accurately calibrated to within ± 2 per cent, and can be reset by the user, if necessary, at any time. The diameter is 1¾ in. over-all, and the weight is ⅓ oz. **For more information write or call: Pacific Transducer Corp., 11836 West Pico Boulevard, Los Angeles 64, Calif.**

OIL AND GAS JOURNAL

# Showcase

- BULLETINS
- CATALOGS
- BROCHURES

**New Tel-O-Set Indicators.** Bulletin 7202 describes the new Tel-O-Set vertical-scale indicator. Up-to-date information on the Tel-O-Set recorders and controllers is also included. These miniature instruments are used to measure and control process variables such as temperature, pressure, flow, and liquid level. **For more information write or call: Minneapolis-Honeywell Regulator Co., Industrial Division, Wayne & Windrim Avenues, Philadelphia 44, Pa.**

•

**Does It Take a River to Cool Your Compressors?** This four-page, two-color flyer illustrates the Model TLA-6, 2,000 b.hp. turbosupercharged gas-engine-driven compressor. Featured is the low water requirement of these units. The literature points out that the 40 per cent reduction in water-cooling requirements means smaller cooling towers or air coolers, fewer wells, and smaller pumps and piping. **For more information write or call: Clark Brothers Co., Olean, N. Y.**

•

**Arc Welding Tubular Steels,** Technical Data Card 155A, summarizes the various recommendations for joining, by arc-welding procedures, various tubing steels. In addition to indicating the proper electrodes to use, it provides information about preheating and post-welding heat treatments. Fabricators and others who have occasion to weld stainless steels and chromium molybdenum alloy steels in tubing and other forms will find this card valuable as a reference. **For more information write or call: Tubular Products Division, The Babcock & Wilcox Co., Beaver Falls, Pa.**

•

**Chromium Impregnation for Corrosion Resistance and Heat Protection.** This reprint describes a number of the advantages derived from Chromallizing, a relatively new process for increasing the heat, wear, and corrosion resistance of ferrous and certain nonferrous metals by high temperature diffusion of chromium into the surface. The four-page illustrated reprint contains specific applications, properties, recommended steels, and information on heat treatment, forming, finishing, and joining. **For more information write or call: Chromalloy Corp., 450 Tarrytown Road, White Plains, N. Y.**

•

**V-Corr Industrial Roofing and Siding.** A new, revised six-page brochure on V-Corr, a corrugated porcelain enamel on steel roofing and siding, describes the maintenance-free and corrosion-resistant properties of V-Corr. In addition, it gives complete engineering data, details of sheets and flashings, and methods of installation. **For more information write or call: Toledo Porcelain Enamel Products Co., 2275 Smead Avenue, Toledo, Ohio.**

•

**Bart Lectro-Clad Process for Positive Corrosion Control.** This fully illustrated eight-page booklet contains information on Bart Lectro-Clad nickel-lined pipe which will withstand any fabrication without affecting the adherence of the nickel. Facilities for processing the pipe in random lengths from 1½ to 24 in. in diameter and 20 to 21 ft. long are covered in detail. Lectro-Clad pipe has


Solve Your Pumping Problem with a

**ROPER ROTARY PUMP**

**FOR REGULAR TRANSFER**

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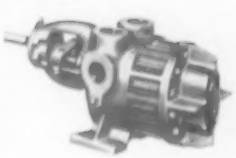

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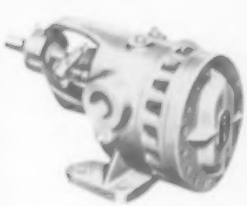
Roper Series H Pump — sizes 10 to 75 G.P.M., pressures to 1000 P.S.I. Ideally suited to those smaller diameter or long, high pressure gathering lines. Self-lubricated spur gears running in axial hydraulic balance, roller bearings and bronze wear plates contribute to efficiency and long service life. With packed box or mechanical seal.



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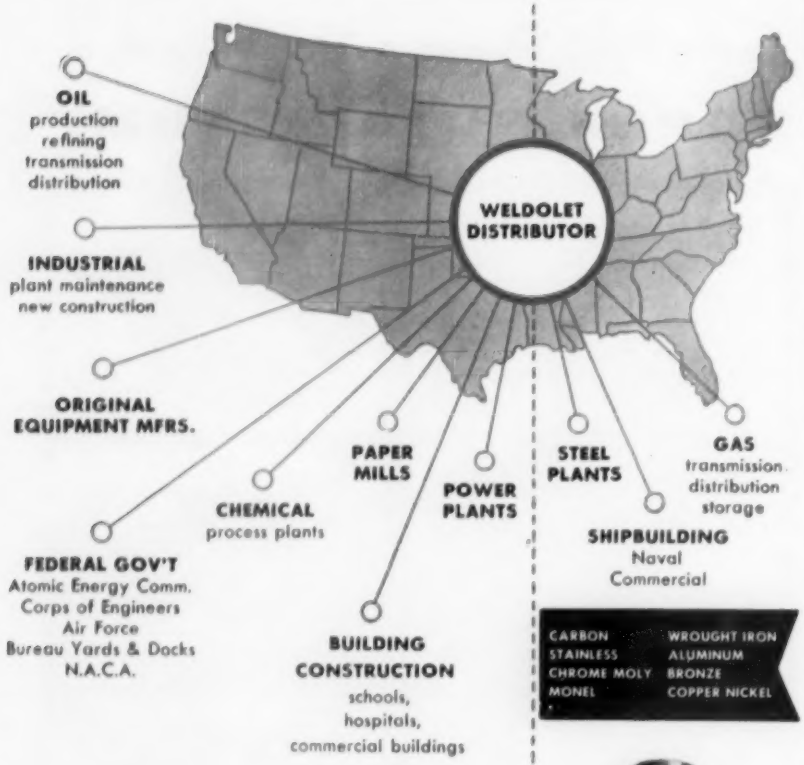


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•

**Multipoint Thermocouples.** Data Sheet 8553 covers full technical data on the three basic types of assemblies manufactured by this company. This informative data sheet covers such facts as the basic design of each type of assembly and illustrations showing construction of each Trinity multipoint thermocouple. **For more information write or call: Trinity Equipment Corp., 472 Westfield Avenue East, Roselle Park, N. J.**

•

**Stainless and Alloy-Steel Fittings.** Engineering data and size-dimensional information on forged stainless and alloy-steel fittings has been published in a new eight-page bulletin, S-1-55. The alloys covered include Types 304, 316, and 304 L stainless steel; 1¼ per cent chromium-½ per cent molybdenum steel; 2¼ per cent chromium-1 per cent molybdenum steel; and 4-6 chrome ½ per cent moly fittings. **For more information write or call: Watson-Stillman Fittings Division, H. K. Porter Co., Inc., P. O. Box 95, Roselle, N. J.**

•

**Gripper Sling Catalog,** a new catalog, covers a line of gripper woven-wire slings. The book illustrates and describes the gripper sling in detail, contains four pages of typical application photographs, and gives complete price and specification information. In addition, a completely new section covers gripper slings covered with Neoprene or plastic for use in handling highly finished material such as polished bar stock. **For more information write or call: Cambridge Wire Cloth Co., 1515 Stonewood Road, Cambridge, Md.**

•

**Van-Cor Pipe, Fittings, and Valves.** Van-Cor is a rigid unplasticized polyvinyl chloride that is highly resistant to hundreds of industrial chemicals and wastes, brine, and sewage. Three bulletins are furnished as a unit. The Van-Cor 1 bulletin describes chemically resistant pipe with normal-impact strength; the Van-Cor 2 bulletin describes chemically resistant pipe with high-impact strength; the third bulletin is devoted to valves. **For more information write or call: The Colonial Plastics Manufacturing Co., 8007 Grand Avenue, Cleveland, Ohio.**

# EQUIPMENT MEN . . . in the News

## Lane-Wells Shifts Key Men In Gulf Coast, West Texas

Six Lane-Wells district executives have moved to new posts, according to an announcement made by Robert E. Bush, division manager of Lane-Wells Gulf Coast division.

E. A. Radack, formerly district superintendent, southern Louisiana district, in New Iberia, moved to New Orleans on temporary assignment as assistant to the division manager. Replacing Radack, A. L. Boyd has transferred from Houston to New Iberia as district manager.

C. E. Shilcutt came from West Texas to Houston, where he will be district manager of the Houston district. J. W. Kiser became district manager of the West Texas district, operating from Odessa.

R. G. Grant moved from his New Orleans post as district sales engineer to Shreveport, where he became district manager of the Ark-La-Tex district. W. D. Long, Jr., formerly in the West Texas district, took over Grant's post as district sales engineer for the southern Louisiana district.

## Web Wilson Names Myers As Oklahoma Salesman

The appointment of Paul M. Myers as salesman in Oklahoma, with headquarters in Oklahoma City, has been announced by Web Wilson Oil Tools, Inc. Myers, with 21 years' experience in the oil fields and as salesman and manager for supply companies, will cover active Oklahoma areas, while maintaining a representative stock of Web Wilson equipment and parts at Oklahoma City.

## National Supply Opens New Store at Venice, La.

National Supply Co. has opened an oil-field-supply store at Venice, La. Venice is located along the Mississippi River, near the extreme southern tip of Louisiana, at the end of State Highway 23. It is in Plaquemines Parish, about 80 miles southeast of New Orleans.

Pete M. Nicoladis has been appointed manager of the store. It is under the supervision of L. A. J. Monroe, manager of the New Orleans district.

## Oil Center Appoints Two Sales Representatives

New sales representatives for the South Texas and southern Louisiana area have been appointed by Oil Center Tool Co., John Maher, president, announced recently. The representatives are Jerry G. Allen, who will work out of McAllen, Tex., and Darrell Talley, who will work out of the Houma, La., branch.

JERRY G. ALLEN

D. TALLEY

Allen is a former sales representative with 8½ years' experience with major supply companies. Talley's past experience includes roughnecking and 18 months' experience with major supply companies.

## Clark Makes McCartney Vice President, Overseas

Appointment of Robert R. McCartney as vice president in charge of overseas operations has been announced by Clark Brothers Co., Olean, N. Y., one of the Dresser Industries. In his new position, McCartney will devote all of his time to the company's rapidly expanding overseas operations. These include registered foreign offices, a large number of manufacturers' agents, and three licensed overseas manufacturers of Clark engines and compressors.

In 1937 McCartney took a position with Clark as a sales engineer. Subsequently, he was named to various management positions in the New York district. In 1953 he was appointed eastern regional sales manager and director of export operations.

## King Oil Tools Establishes Shreveport Distributor

A new distributing center for King Oil Tools has been established in Shreveport, La., at the Tommy Davis Warehouse Co., it has been announced by Walter E. King, senior partner of the Houston tool manufacturing firm.

Tommy Davis has been active in the oil industry for the past 11 years, starting with Arkansas Fuel Oil Corp. in 1945. Following this, he had 5 years' experience with a major oil-field-supply company and 3 years under contract with a rubber company dealing directly with the oil-field-supply and the oil and gas industries. The Tommy Davis Warehouse Co. was formed 3 years ago and provides 24-hour pickup service.

The full line of King tools is carried in stock at the Tommy Davis Warhouse Co. in Shreveport.

## T. D. Williamson Announces Increased Sales Force

O. E. THOMPSON

T. D. Williamson, Inc., recently announced the appointment of O. E. (Neal) Thompson to assistant sales manager; the appointment of R. R. Hughes of R. R. Hughes Co., Seattle, as representative for the Pacific Northwest including the states of Washington, Oregon, Idaho, and Montana; and the appointment of E. C. (Paul) Robinet of Cameron Engineering Co., Los Altos, Calif., and R. M. Riddell of R. M. Riddell Co. of Pasadena, Calif., as northern and southern California representatives respectively.

Assisting Thompson will be Kenneth Hulse and John Montgomery, both of whom have been associated with the sales department for several years. Thompson joined the company in 1948.

For 12 years Hughes was associated with Industrial X-Ray Engineers of Tulsa, the last 7 years of this association as vice president and general manager. During 1955 Hughes formed his own company and is now actively engaged in distributing specialized equipment to the pipeline and related industries.

Robinet has been associated with the petrochemical and allied industries in

the distribution of mechanical equipment throughout the San Francisco Bay area for the past 17 years. Riddell has varied experiences both as sales engineer and sales manager in different phases of the industry.

## United Supply Makes Jones Vice President

R. NEIL JONES

R. Neil Jones has been promoted to vice president of United Supply & Manufacturing Co., it has been announced by Brooks Gutelius, Jr., president.

Jones joined United Supply at Odessa, Tex., in 1942. In 1943 he was transferred to Tulsa, the company headquarters, and since that time has extensively covered oil-field-supply operations throughout the Mid-Continent and Gulf Coast areas.

## Mountain Iron Announces New Pawhuska Outlet

Completion of a new outlet in Pawhuska, Okla., for Mountain Iron & Supply Co. has been announced by Al Bouse, sales manager. Making the third Oklahoma outlet, the Pawhuska store is in addition to units in Bartlesville and Tulsa.

The new store offers ample parking and loading docks. A complete line of tubular goods, including sucker rods, is stacked on the docks, ready for easy loading. In back are facilities for loading engines and other heavy equipment. The store stocks Fairbanks-Morse and Continental oil-field engines, and American, Alton, and Jensen pumping units. A complete pump shop is available for overhauling working valves and bottom-hole pumps.

Gene Turner will superintend the Pawhuska unit in addition to the Bartlesville store, of which he is now superintendent. Richard Popp, formerly of Misco's Great Bend store, will manage the Pawhuska outlet. Field salesman will be Bill Day. Clarence Wiley has been promoted to manager of the Bartlesville store.

## Lucey Products Elects Blase To Board of Directors

ROY C. BLASE

Election of Roy C. Blase, secretary and credit manager, to the board of directors of Lucey Products Corp. has been announced by Franklin E. Bernsen, president. Blase joined Lucey in February 1951.

## Fenton to Head Oilwell's West Central Texas Area

J. H. FENTON

The appointment of J. H. Fenton as manager of the West Central Texas district of U. S. Steel's Oil Well Supply Division has been announced by William Miskimins, Central Midwest area manager of the division. Fenton will be located at Abilene, Tex.

Fenton was employed by Oilwell in 1938 at Harbor City, Calif., and served in various California locations in sales and managerial positions until 1942, when he was appointed field auditor and transferred to Dallas, Tex. In 1947 he was appointed inventory-control supervisor at Dallas. In 1951 he was named district merchandise manager and transferred to Wichita Falls, Tex., becoming assistant district manager at this location, where he remained prior to his present appointment.

## Guiberson Holds Sales, Engineering Conference

The Guiberson Corp. recently held a general sales meeting at its Dallas plant. More than 50 sales representatives and executives of the corporation attended.

Gordon G. Guiberson, president, expressed confidence in continued growth of the corporation, established in Dallas in 1919. Alex P. Smith, executive vice president and general manager, reviewed the corporation's policies, described the new machine tools recently added to the plant, and outlined the building expansion program now under construction and due for completion in 1956. The third major expansion recently announced by Guiberson, this program when completed will increase working areas of the machine-shop plant by 80 per cent and the rubber plant by 65 per cent, according to Smith.

The 2-day meeting was conducted by Harry S. Zane, Jr., sales manager, who stated that an all-time-high sales record had been established by the corporation each succeeding year for the past 5 years. The conference was devoted to discussions on improvement of present equipment produced by Guiberson and development of proposed new equipment.

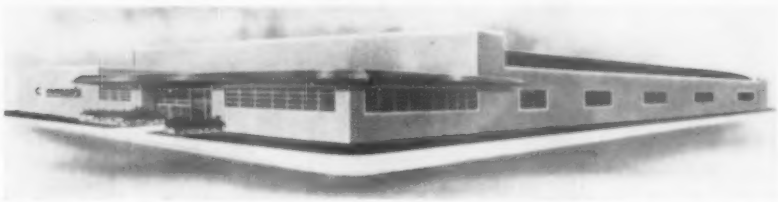
**Guiberson executives and representatives attending the sales meeting were: Front row, B. M. Calhoun, J. T. Anderson, H. W. Haltom, Harry S. Zane, Jr., Alex P. Smith, Gordon G. Guiberson, W. R. Guiberson, P. L. Brown, J. R. McManus, R. W. Lindsay, Jr., D. L. McGill. Second row: R. A. Day, B. R. Everett, B. M. Matthews, E. C. Trott, L. T. Ferguson, C. W. Green, J. P. Killingsworth, E. E. Embury, H. H. Louden, R. Z. Mendenhall, L. E. Brookover, L. J. Lipp. Third row: F. C. Barritt, A. E. Brummett, C. A. Teel, R. L. McAdams, R. J. Foreman, O. A. Hess, C. L. Forcum, R. D. Hicks, C. B. Alexander, W. R. Forcum, J. L. McHenry, D. L. Ery, W. V. Phillips. Fourth row: R. L. Plattsmier, J. B. Haynes, W. F. Meier, C. W. Parker, F. H. Bronaugh, J. G. Cates, A. M. Alexander, D. E. Ritchie, R. W. Rutherford, Peter P. Kizis, L. E. Vessels, C. E. Lance, D. B. Craver. Not shown in the picture but at the meeting were M. W. Breedlove and G. P. Lyons.**

## Caran Bros. Organize Caran Engineering Corp.

Caran Engineering Corp. has been formed by the Caran Brothers interests in San Antonio, Tex., to consolidate the services offered by Caran Brothers Engineering Co., International Exploration, Inc., and Hydrocarb, C. A.

The new corporation's activities, both domestic and foreign, will include mud logging, core analysis, and reservoir engineering. A new and improved spectrochemical method for the qauntitative measurement of hydrocarbon gases in the mud stream has been developed and this new service will be available to the oil industry.

## Corkens Completes Building at Oklahoma City



**The new plant and office of Corkens, Inc., at Oklahoma City is fully equipped with the latest machine tools and equipment. It doubles the manufacturing capacity of a full line of L-P Gas and anhydrous ammonia liquid pumps and compressors, plus a new line being introduced for the petrochemical industry. Charles M. Corken is president and general manager, and Garth P. Kennedy is vice president and chief engineer.**

## Bucyrus-Erie Names Stone Well-Drill Sales Manager

The appointment of Selden A. Stone as well-drill sales manager was announced by Bucyrus-Erie Co., South Milwaukee, Wis. He had been assistant drill sales manager with the firm since 1953. Stone will direct spudder sales throughout the United States and Canada in his new capacity with the company.

Stone started in the oil-field-supply business with Parkersburg Rig & Reel Co. and later was with Continental Supply Co. He was with Franklin Supply Co. 2 years as store manager and field salesman and was with International Derrick & Equipment Co. for 1 year. He has been with Bucyrus-Erie drill-sales organization for 14 years.

## Roche Joins Beacon to Head Supply, Distribution

E. M. ROCHE

Edward M. Roche will join Beacon Petroleum Co., Tulsa, as manager of supply and distribution, it has been announced by Jerry Feroe and Bob Bolinger of Beacon. Roche has 16 years' experience in railway shipping and was formerly employed in Kansas City as assistant general freight agent for the Chicago Great Western Railway. He served 5 years as general agent for Great Western in Tulsa, where he became acquainted with shipping of L-P Gas and other petroleum products.

At Beacon Petroleum, Roche will be responsible for moving schedules of all products to the proper markets.

## Texas Instruments Buys Burlington Instrument Firm

Announcement of an agreement to purchase the business and assets of Burlington Instruments Co. was made by J. E. Jonsson, president of Texas Instruments, Inc. The purchase will be a cash transaction at an undisclosed figure. The acquisition will both complement and broaden the range of electronic and electromechanical components and systems available to the electronics industry from the Texas firm.

Burlington Instruments, manufacturer of electrical indicating instruments, is located in Burlington, Iowa. Jonsson announced that the entire operation will be integrated with the TI components division and transferred to Dallas as soon as possible without the interruption of deliveries to present Burlington customers. Manufacturing space already has been leased near the main Dallas plant of Texas Instruments to relieve the expansion of the components division. J. P. Rodgers, Jr., is general manager of the TI components division, which currently manufactures a broad line of precision resistors, transformers, capacitors, and delay lines.

## Oilwell Appointments Made in Three Areas

The appointment of Melvin D. Cabbage as field representative at Monahans, Tex., for U. S. Steel's Oil Well Supply Division has been announced by William Miskimins, Central Midwest area manager. Appointment of Billy E. Hestand as field representative at Alice, Tex., has been announced by M. F. Jones, Gulf Coast area manager. W. A. Weir, Canadian area manager, announced the appointment of William M. Wallace as field representative at Red Deer, Alta., and the naming of John W. Carnwath as sales representative for refinery and pipeline equipment at Calgary.

Cabbage joined the division in October 1955 at Odessa, Tex. Hestand was employed in 1952 at Odessa and was located at Corpus Christi, Tex., prior to his present appointment.

Wallace was employed by Oilwell in 1953 at Okotoks, Alta., later was transferred to Wetaskiwin, and in July 1955 was transferred to Red Deer. Carnwath has just been employed by Oilwell.

## Alco Names Davis Manager of Sales, Spring & Forge Items

The appointment of Joseph W. S. Davis as manager of field sales for spring and forge products was announced recently by Alco Products, Inc. Davis joined Alco as a sales clerk in New York City in 1926 and subsequently was a salesman and a district manager of spring and forge sales.

## Edward Valves Doubling Size of Laboratory

**Edward Valves, Inc., a subsidiary of Rockwell Manufacturing Co., has announced that it is doubling the size of its research laboratory in East Chicago, Ind. The new addition will be completed in the spring of 1956, according to W. F. Crawford, president.**

# 25% INCREASE IN PENETRATION RATE WITH DRISCOSE*!

Figures for 10 Texas wells, where characteristics of mud systems were practically identical with respect to viscosities and weights, show that the use of **DRISCOSE** in a mud with a low concentration of solids helped to increase rate of penetration approximately 25%. Water loss was lower, too . . . 6 to 8 cc with **DRISCOSE** as compared to 10 or 12 cc where **DRISCOSE** was not used. And in addition, wells that mudded up at 10,000 feet with **DRISCOSE** continued to drill just as fast as when they were using clear water . . . no slow-up of penetration due to mudding with **DRISCOSE!** Write for complete information.

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# DRISCOSE*

**DRILLING SPECIALTIES COMPANY**

BARTLESVILLE, OKLAHOMA

*DRISCOSE is a trademark for Sodium Carboxymethylcellulose.

## EXPLORATION

# Geologists Will Study Four Separate Provinces On Super Inspection Trip

**by Frank J. Gardner**

**Route map of the San Angelo Geological Society's field trip reveals four geological provinces to be studied in 2 days.**

IT had to come. A supercolossal field trip—bigger and better than any other. And where? You guessed it. Texas.

The San Angelo Geological Society is staging it on March 16 and 17. The objective is to take a close look at not one, but four separate geological provinces—the "last frontiers" for Southwest Texas exploration, according to the publicity releases.

In a planned caravan of 200 cars, the host society expects to show 800 to 1,000 guests just what lies in store for future drilling in the Kerr basin, the western Balcones fault zone, and the upper reaches of the Rio Grande embayment. Outcrops and mineral deposits of the great Central Mineral Region will be also examined and explained.

**Bankers, lawyers . . .** This field trip, traversing some of Texas' most picturesque country, promises to be a bit on the extraordinary side. Not only geologists and geophysicists are going along, but bankers, landowners, lawyers, and some senators and representatives from the Lone Star legsilature have also been invited.

Now there's a new twist. To our knowledge, this will be the first mating of the legal beagle with the rockhound, and the first meeting of the money-bag and the outcrop. But maybe these boys have the right idea. If your banker and your lawyer and your senator can see the problems and the risks firsthand, they may think twice the next time they're inclined to hike your tax or cut your allowable.

**TV, too . . .** Another switch—this trip will be televised. Humble Oil & Refining Co. will film the whole thing and show it to TV audiences via its series of programs called "Texas in Review." Here's a good idea for bringing geology before the public and future field-trip planners should take heed.

The trip will begin at Buchanan Dam, and will cover numerous outcrops in the Central Mineral Region. This is the geographic and geologic heart of Texas, the Llano uplift, where many Texas geology trainees receive their first field experience. It is a natural museum of outcrops, minerals, fossils, folds, and faults, and by studying its surface complexities, the student acquires an understanding of similar subsurface features that cause oil and gas to be trapped.

**See a basin that is new . . .** Leaving the uplift, the caravan will cross the heart of Kerr basin. Here is a basin of deposition about which we know little. It lies in the syncline between the San Marcos and Edwards arches, which originate from the Llano uplift and extend outward under Cretaceous and upper Pennsylvanian beds. It's a basin which should hold oil traps, for it received a thick section of Pennsylvanian and Ordovician sediments. Some small oil wells have been completed within its limits. Geologists feel that it merits a great deal of study, and that with these studies will come many new fields.

**Faults and folds . . .** After spending a night at the famous dude ranches of Bandera, the travelers will take a look at the surface folds and faults and the scenic outcrops of the Balcones fault zone. It is in this province that active shallow wildcatting has uncovered many new fields in the past 2 years. But the massive Cretaceous rock ledges that provide the scenery here are expected to provide much more than that on the subsurface. Again, by studying the surface, the geologists can better understand what to expect in the search for the buried oil pools to the east and south.

**Of giant size . . .** The trip will end at Del Rio following an afternoon of studying the surface features in the upper reaches of the Rio Grande embayment. Here is another province that should harbor some good oil fields. Exploration is slowly encroaching from the east, but wildcat drilling in the region is below par.

This is the setting for the great 60-mile-long Chittim anticline, plunging southeast into the heart of the embayment. This giant regional feature has been known and mapped for decades, but only in 1955 was the first oil produced from it. There should be many other smaller structures throughout the embayment that will yield oil, but the exploration story there is still one of neglect.

**Fish and peas and hot fried pies . . .** This is the first time that a host society has published its menus in advance. Noon luncheons will be served on the banks of the Pedernales River and at the great Anacaho ranch, and the food will be typically Texan. So if you're interested in a colorful trip, and aren't allergic to hush puppies, black-eyed peas, fried fish, and hot fried pies, we recommend it. Besides, you might arrange a bank loan, a lawsuit, or a tax cut along the way. Details and a brochure are available from the Arrangements Committee, San Angelo Geological Society, 604 McBurnett Building, San Angelo . . . Texas, of course.

*Here's the essence of . . .*

# What Geophysicists Will Hear Next Week

**. . . that successful exploration depends upon the integration of geology, geophysics, economics and production, and land. In short, speakers will look at new horizons.**

SOCIETY of Exploration Geophysicists will stress integrated exploration at the ninth annual midwestern meeting in Fort Worth, March 7-9. Here are selected abstracts of certain of the papers that will be given at the meeting.

### Seismograph Correlation Between Permian Reef Line and Basin-Type Section, Hockley County, Texas

**John Daly,** consultant in geophysics and geology, Midland, Tex.

The purpose of this paper is to show that the seismograph is a useful tool in solving stratigraphic problems in the Permian basin area. The correlation of the massive carbonate deposits of the barrier-reef line with the bedded clastics and carbonates of the basins is particularly difficult.

These sedimentary changes are often marked by anomalous reflections arising from the detritus-carbonate interface on the basinward, steeply dipping scarp of a reef line. In parts of Hockley County, Texas, the reef dips are good and can be carried continuously from the basin over the reef line and into the back reef or lagunal areas.

The massive dolomite of the reef section which occurs about 300 ft. below the top of the Tubb zone is correlated with the base of the Dean sand.

### Geological Outlook

**Dr. A. I. Levorsen,** independent geologist, Tulsa.

Geologists and geophysicists have the same outlook, and whoever practices one must of necessity practice the other. They are not separable. Our joint outlook, then, is first for a continuing acceleration in petroleum demand which makes an increasing rate of discovery a basic essential to the petroleum industry. The answer to the question, "Is it there to be discovered?" is personal. But there seems to be adequate unexplored geology to justify the conclusion that petroleum in amounts necessary to meet the demand await discovery.

The final question, "Can it be discovered?" depends on two factors that have become typically American. These are: (1) the opportunity to continue multiple effort as a way of exploration; and (2) the opportunity to continue an equilibrium of opportunity in the management of exploration.

With these two, the petroleum can be discovered. But without them, the chances are that the petroleum will remain in the ground — undiscovered and useless.

### Geophysical Outlook

**Holland C. McCarver,** Seaboard Oil Co,. Dallas.

What is the outlook of geophysics? This very timely and thought-provoking question is of concern to all petroleum-exploration people. If geophysics is to continue in its dominant role of oil-finder, definite and productive steps must be taken in the field of technical advances, economics, personnel, and application.

Regardless of impressive superficial advances, the geophysical tool must steadily contribute to the discovery of new oil reserves or it will not be used.

### Practical Applications of Magnetic Methods in Oil Finding

**James Affleck,** Gulf Research & Development Co., Pittsburgh.

This paper discusses the usefulness of the magnetic method in an exploration program. The sources of magnetic anomalies and basement characteristics are described, and this illustration shows typical profiles over basin and uplift zones and samples of magnetic data and derivatives over known structures.

### Magnetic Tape Can Find More Oil

**Phil P. Gaby,** Delta Exploration Co., Jackson, Miss.

Advantages to be obtained with magnetic tape may be broadly divided into:

1. Storing data to derive advantage from development of any technique.
2. Furthering present research.
3. Obtaining enough advantage and improvement to allow finding oil NOW that probably would not be found otherwise.

A clear policy decision is required between 1 and 3 because these are mutually exclusive to a large degree. This paper deals with present use of tape indicating several general types of cases where substantial improvement is now available through, and only through, magnetic recording. Sample record-cross-sections will be available for inspection.

### Getting the Most Out of Present Seismic Instruments

**Dr. J. E. Hawkins,** Seismograph Service Corp., Tulsa.

Much of the present seismic work is being carried out in areas where results are difficult to obtain. This paper outlines the requirements for seismic instruments for these operations. The particular characteristics desired for specific problems are illustrated, and the instrument factors that affect these characteristics are outlined. Examples of the effect of instrument adjustment are shown. Means of arriving at optimum results with present equipment under diversified field conditions in different areas are illustrated by specific cases.

### Research Horizons

**Dr. Dayton H. Clewell,** Magnolia Petroleum Co., Dallas, and chairman of the S.E.G. Research Committee.

Prediction of future research can be the most uncertain of all predictions. However, to the extent that necessity is often the mother of invention, we can expect the rising costs of oil exploration to greatly influence current projects in exploration research.

Research in both geology and geophysics will be aimed at the stratigraphic trap. A great amount of geological research work will be concerned with the details of the origin of oil and the origin of reservoirs. This kind of information is needed to stimulate new thinking about where to look for new oil. We can expect to secure much more subsurface information from drilled wells than we have ever done in the past.

It also appears that we are on the verge of really substantial advances in our ability to do a better job of interpreting geophysical data.

"Geologists and geophysicists have the same outlook, and whoever practices one must of necessity practice the other. They are not separable." *Dr. A. I. Levorsen.*

**Report on Continuous Velocity Logging**

**Homer W. Lawrence.**

Several types of velocity-logging tools are presently in use, some on an experimental basis and others commercially. Those types on which information has been released are briefly described.

Velocity logs have been run in over 750 wells, about half by oil companies using their own instruments and the other half by commercial contractors. Geographical distribution of the wells logged is wide. It includes Canada, Venezuela, France, and England, as well as the United States.

Applications of velocity logs, other than as a velocity tool, are increasing with the corresponding increase in the number of wells logged. The correlation potential of the logs is immediately apparent. Recent experimental work and papers have pointed out velocity-porosity relationships and possibilities of determining fluid content.

**The Geologic Causes of Gravity Anomalies**

**Dr. Robert J. Watson,** Carter Oil Co., Tulsa.

The appearance of gravity maps of various kinds of anomalies to be expected in a basin area is demonstrated by menas of snythetic examples. Conditions of density contrast and structural relief necessary to produce detectable anomalies are shown. The possibilities of these favorable conditions being present in the Mid-Continent area are briefly considered.

**Areas of Promise for Future Exploration—Mississippi and Alabama**

**Wilbur H. Knight,** Union Producing Co., Jackson, Miss.

The most promising area for future exploration is in the Lower Cretaceous rocks of southern Mississippi and adjacent southwestern Alabama. It is believed that additional exploration in this area will result in the discovery of new substantial oil and gas reserves. To date, discoveries in this province—with one exception—have been the result of subsurface prospecting. However, any long-range exploration program will have to depend, for the most part, on seismic work, inasmuch as most all the better subsurface prospects will soon be tested.

The Black Warrior basin of northeastern Mississippi and northwestern Alabama remains an area of promise. Development to date in this Paleozoic area has been disappointing. But, all the components of a productive sedimentary basin are present, and it is believed that if wildcatting is substantially increased, the discovery of new important reserves will inevitably result.

**Evolution of Seismic Instruments**

**Dr. John P. Woods,** Atlantic Refining Co., Dallas.

Seismic prospecting is 30 years old. In this time, seismic instruments have changed greatly. The problems of prospecting are now more difficult. To meet the increased difficulty, seismic instruments have been changed so that much more data is taken.

The approach has been statistical. The bad data is canceled by various averaging processes. In the past, there have been several near-revolutions in the seismic method. Today it appears that great changes in instruments and methods may come from the introduction of magnetic recording, computing machines, correlation machines, and the generation of seismic waves by weight dropping. At present, it is hard to evaluate these possibilities.

**The Unit Approach**

**John H. Folks,** Carter Oil Co., Oklahoma City.

Rising land costs, coupled with limited available seismic coverage in basins presently covered by diverse checkerboard protective leasehold ownerships, demand better methods of evaluation. Drilling of prospects by accepting the conventional dry-hole or acreage contributions with or without overrides is no longer a fair arrangement.

The objections to creating mutual areas of interest and the subjection of leaseholds to joint operating agreements must be overcome. One of the outstanding objections has been the amount of effort and loss of time inherent in negotiating an operating agreement which is acceptable to the unit partners. This feature will be greatly overcome by a model form operating agreement which will be available to industry in 1956.

**Interpretation of the Results of Magnetic and Gravimetric Surveys With the Aid of Modern Electronic Computing Equipment.**

**Dr. E. G. Kogbetliantz,** I.M.M., and the New School for Social Research, New York.

The fantastic speed with which modern electronic computers perform fundamental arithmetic operations opens unlimited possibilities for improving the scope and accuracy of technological computations. This paper discusses the use of electronc data-processing machines for the computation of the regional anomaly, derivative maps, and the continuation to various depths from a given observed anomaly map.

**Provinces for Future Exploration—West Texas and New Mexico**

**Dr. William A. Waldschmidt,** consulting geologist, Midland, Tex.

Let's briefly review the major geological provinces of West Texas and southeastern New Mexico and the subdivisions. In doing so, we will attempt to select, in a general way, some of the areas that might be considered to be oil provinces for future exploration.

Of the established geological provinces, the Delaware and Val Verde basins are considered worthy of additional exploration. Some of the smaller areas, or subdivisions of the established geological provinces (also believed good for further exploration) include the east and southwest flanks of the Delaware basin, the west edge of the eastern shelf, the area along the west side of the Midland basin, and the large atoll-like trend at the northern end of the Midland basin. We will conclude with suggestions that might be helpful in planning exploration in these areas.

**Subsurface Provinces and Future Exploration in Oklahoma, Kansas, and North Texas**

**Dr. Carl A. Moore,** chairman, School of Geological Engineering, University of Oklahoma, Norman.

A great number of petroleum-exploration techniques are being utilized in the search for oil in Oklahoma, Kansas, and North Texas. Current emphasis is being placed on locating a favorable geological area, or province, and then adapting the proper exploration tools to the problem of finding oil in that favorable area.

In this area, there are a number of subsurface provinces which are now being actively explored for oil. These provinces include the broad uplifts on which many major fields have been found, and the sedimentary basins and embayments in which present exploration is being conducted with sporadic success. An attempt is made here to evaluate this current exploration activity.

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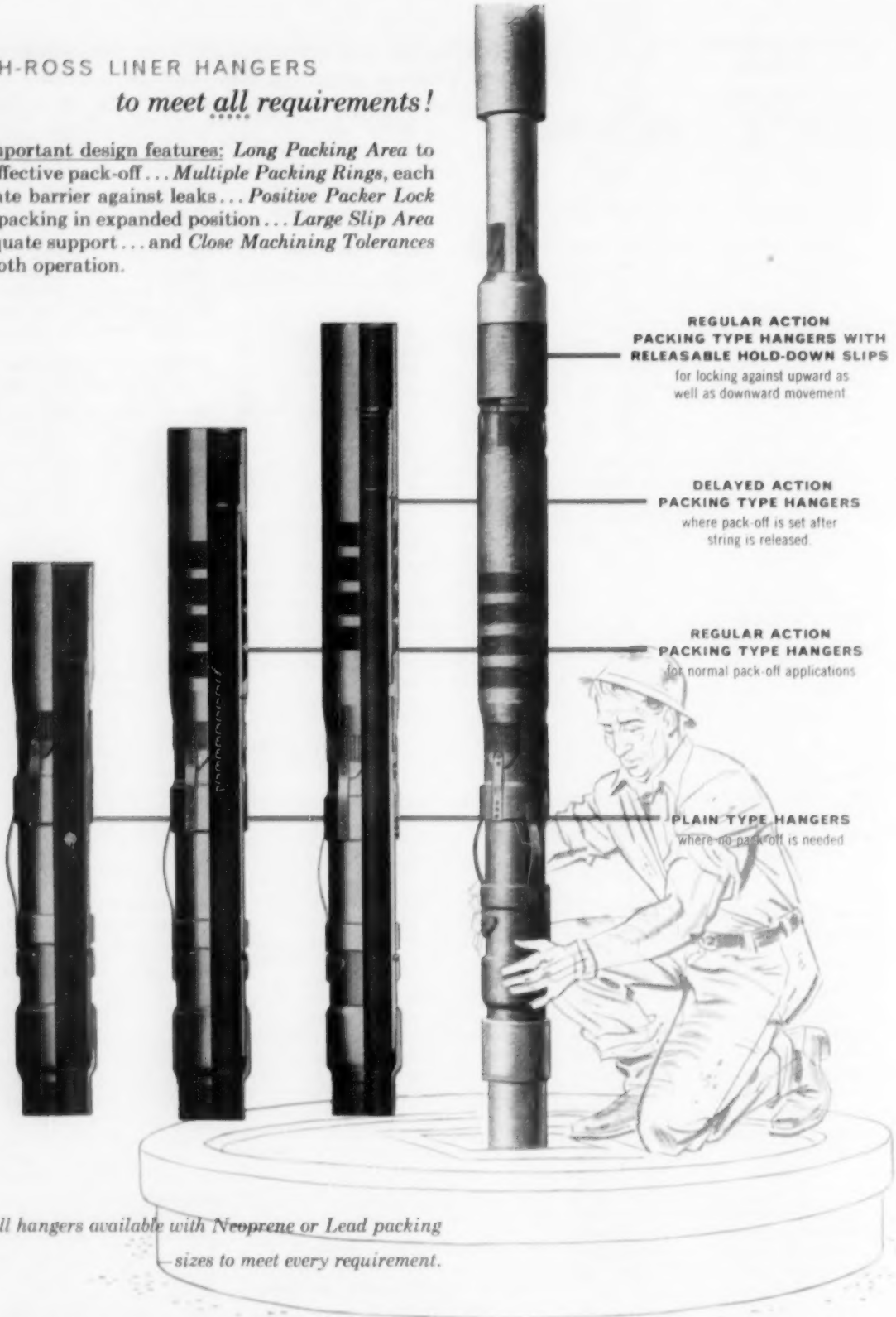


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# Oklahoma Leads the Mid-Continent In Action, and in Promise

## Central, northern, and southern portions share interest

The first few weeks of 1956 in Oklahoma exploratory and development drilling promise a good year for the state with success widespread. Particular areas of interest include the central, northern, and southern portions.

**Central . . .** West Short Junction field in Cleveland County continues to grow. There are 85 producing oil wells in this Hunton reservoir, and only one dry hole reported.

There are four pay zones in the field: the Hunton, Haragan, Unconformity, and Bartlesville sands.

The east side of Oklahoma County received a new reservoir at Russell Cobb, Jr., and Provincial Oil Co.'s wildcat in 3-13n-1w. This discovery flowed 24 bbl. of distillate and 2,000 M.c.f. of gas from the Skinner-Pennsylvanian sand at 5,500 ft. E. J. Athens opened a pool in the NW NW NE 2-12n-1w. The well flowed 2,000 M.c.f. of gas per day and recovered 45 ft. of condensate on drill-stem test in the Misener-Hunton at 5,811-32 ft. Orchard City pool was extended at Ashland Oil & Refining Co. and A. J. Parker's wildcat, the 1 Pointon, NE NE 15-11n-1w. The well flowed 528 bbl. of oil daily on small choke from perforations at 6,182-87 ft.

**North . . .** Drilling was revived in the McWillie area of Alfalfa County at Trigg Drilling Co. 1 Nelson, NE SE 14-24n-11w. The Oswego lime flowed oil on 23/64-in. choke.

A wildcat in NE SW 7-24n-10w, Alfalfa County, promises to be a discovery. Western Oil & Gas Co. 1 Crissup tested at 6,186-6,276 ft. The well flowed about 4,000 M.c.f. per day. Production tests are due.

In Garfield County Russell Cobb reworked an old wildcat, the 1 Meyers, SE NW 8-24n-3w, opening a new indicated reservoir. The well flowed 15 bbl. of oil per hour from perforations in the Skinner sand at 4,978-83 ft. Frankel & Reynolds have a Wilcox sand discovery in NW NE SW 12-20n-4w. The well flowed 50 bbl. of oil per hour from the first Wilcox sand.

The big play in Grant County is centered in two areas, the Eureka district, and the new Wilcox area near Wakita. Development drilling continues high in the Eureka-Bartlesville sand trend which now extends 30 miles east-west across northern Grant and Alfalfa counties.

Union Oil Co. has a Wilcox sand discovery near Wakita at 1 Rapp, SE SE 25-28n-7w. Logs show a possible 29 ft. of Wilcox sand pay at this discovery.

**South . . .** A new Bromide sand pool was opened near Durant in southeastern Oklahoma's Bryan County. The 1 State, SE NW SW 25-6s-8e, flowed 75 bbl. of distillate per day on small choke from perforations at 9,640-9,712 ft. A later test got 22 bbl. of distillate in 22 hours on 10/64-in. choke with a gas-oil ratio of 17,700:1.

Anderson-Prichard Oil Corp. opened a shallow pool near Clarita in Coal County. The 1 Woods, NE NE SE SW 23-1n-8e, flowed 311 bbl. of oil in 23 hours from perforations at 1,960-98 ft. Considerable seismic work is in prospect for this area of Oklahoma.

Humphrey Oil Co. and Superior Oil Co. opened a Bromide sand pool at 1 Ledgerwood, SW NW NW 17-4n-2w, Garvin County. The flow rate at the well was 5 bbl. per hour from perforations at 7,384-89 ft. Later the flow fell and pump was set up.

The Madill North field in Marshall County, a prolific Ordovician reservoir, continues to expand with many dual completions. All wells have high flow potentials from the many Ordovician pay sands in the field.

Frankfort Oil Co. added further fuel to the Arbuckle fire in Murray County at 1 Hale. The well perforated at 7,045-7,110 ft., flowing 400 bbl. of oil daily on ½-in. choke. Further pay is indicated at 6,885-6,934 ft. It is reported that the well may complete from both zones. This discovery area is in SW NE 4-1s-1e.

### KANSAS

## Operator Tests Arbuckle Oil at Trego Wildcat

Transit Corp. is testing oil in the Arbuckle at 1 Kroeger, SE NW SE 36-13s-21w, 4 miles east of Locker pool, eastern Trego County.

A drill-stem test at 3,940-57 ft. recovered 120 ft. of gas, 65 ft. of slightly oil-cut mud, 126 ft. heavily oil-cut mud, and 126 ft. muddy oil.

## Stafford Indicated Strike Continues Testing Oil

Transit Corp. and Monsanto are swabbing at 1 Krankenberg, SW SW SE 19-22s-12w, indicated discovery 2 miles south of Drach pool in Stafford County.

The well reported a fillup of 2,800 ft. oil after fracture treatment. Perforations at 3,711-16 ft. in the Simpson swabbed 2 bbl. of oil per hour before the fracturing took place.

# HUGOTON EMBAYMENT

### OKLAHOMA PANHANDLE

## Beaver and Texas Areas Lead Embayment Program

The Oklahoma Panhandle is enjoying one of its busiest periods in several years of drilling. First-of-the-year developments in the region include:

Cabot Carbon Co. 2-Barby-B, 27-4n-25eCM, is a dual discovery, flowing 5,600 M.c.f. of gas per day from the Morrow sand at 6,936-64 ft.; 10,000 M.c.f. per day from the Chester-Mississippian at 7,021-64 ft. The north offset is underway to this important new discovery area of Beaver County.

Orville H. Parker 1 Sleeper, 25-2n-23eCM, flowed 5,210 M.c.f. of gas per day from the Morrow sand at 7,661-7,731 ft. The 1 Pruett in 30-2n-24eCM, flowed 106 bbl. of oil in 20 hours on 14/64-in. choke. This is a Thirteen Fingers lime producer at 7,464-80 ft. Warren Petroleum Corp. had excellent success at its 1 Harris in 19-1n-21eCM. This discovery flowed 8 bbl. of oil per hour from 7,440-50 ft. in the Morrow, also making 16,000 M.c.f. of gas per day at 7,862-80 ft., also in the Morrow. The Texas Co.

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opened a Chester lime gas pool at 1 Gulf Coast Western-A, 9-5n-24eCM. The big well made 16,340 M.c.f. per day from 6,410-32 ft. United Producing Co. 1 Mayo, 18-4n-25eCM, is a Morrow gas discovery at 6,778-6,856 ft. That strike flowed 4,500 M.c.f. daily.

A fast-growing development program is in high gear in the eastern sections of the Camrick and Grand Valley areas. Atlantic Refining Co. 1 Flowers-B, 8-1n-20eCM, flowed 121 bbl. of oil in 6 hours from perforations at 6,990-7,002 ft. in the Morrow sand. The well also has a gas potential of 4,500 M.c.f. per day at 7,292-7,318 ft., also in the Morrow.

East Camrick field was extended at Magnolia Petroleum Co. 1 Stewart, C SE SE 16-1n-20eCM. This well flowed 104 bbl. of oil in 8 hours from perforations in the Morrow sand at 7,187-7,203 ft.
tion status.

The prolific Northwest Mocane field area of Beaver County continues to add excellent wells. Kerr-McGee Oil Industries, Inc., 1 Raymond, 31-6n-25eCM, flowed 248 bbl. of oil in 21 hours on ½-in. choke. Pay is the Hodges-Checkerboard lime at 5,270-82 ft.

On the Texas County side of the Camrick area, Carter Oil Co. 1 Bowles-Morris, SW SW NE 34-2n-19eCM, flowed 61,000 M.c.f. of gas per day from perforations in the Morrow sand at 6,635-59. On the western side of the county in the Keyes district, Howard Saunders 1 Pike, NW NE SW 5-5n-10eCM, flowed 44,600 M.c.f. of gas per day from the Keyes sand at 4,626-32 and 4,558-4,622 ft.

### SOUTHWEST KANSAS

## Clark County Has Possible Discovery

A new pool for eastern Clark County is in prospect at Trans-Era Petroleum Co. 1 Randall, C SW 6-33s-21w, 5 miles northwest of Harper Ranch field, and 1 mile north of Sitka, Kans.

Recovery on a Lansing drill-stem test at 4,867-83 ft. was 1,980 ft. gas and 120 ft. gassy and heavily oil-cut mud.

# ARK-LA-TEX

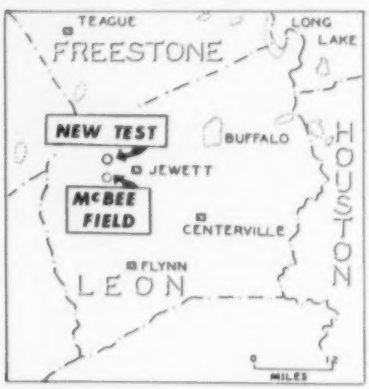
### EAST TEXAS

## Leon County Will Get Additional Testing

Sun Oil Co. has scheduled further deep exploration work for Leon County, in the area where last year the company brought in a dual discovery, from the Rodessa and the Travis Peak.

The new well is 1 Arthur A. Diehl, located on a 194-acre lease in the Daniel M. Frisman Survey, A-267. Location is in the northwestern part of Leon County, 6 miles north of McBee field, the dual discovery by Sun. Projected depth is 9,300 ft.

The McBee opener was drilled as 1 Golie, James A. Fryer Survey, 5½ miles southwest of the town of Jewett. It was completed during the first quarter 1955. Potentials were: 1,650 M.c.f. gas per day from the Travis Peak at 10,039-10,152 ft., plus 53.8° oil on a GOR of 326,254:1; and from the




**Location of Sun Oil Co.'s exploratory test in the area of McBee field in Leon County.**

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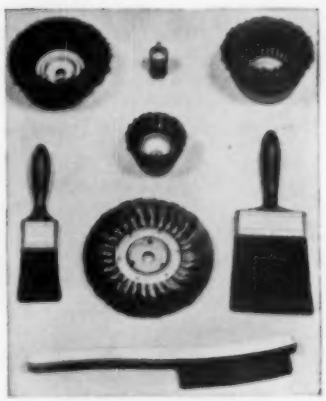

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Rodessa at 8,833-41 ft., daily gage was 6,700 M.c.f. of gas, plus 30 bbl. of 53° oil, for a GOR of 35,826:1. Shut-in pressures on both zones was around 3,495 psi.

Development around the McBee field to date has been one gas well, Sun 1 Lizzie Barkley, and one dry hole at the 1 R. H. Evans.

## EASTERN INTERIOR

### ILLINOIS

### One New Oil Pool in Illinois in January

One new oil pool, Pankeyville in Saline County, was discovered in January, according to the State Geological Survey of the Department of Registration and Education. There were 10 extensions to pools and 6 new pays in pools discovered during the month.

Pankeyville is the ninth new pool discovered in Saline County in the past 12 months. Drilling activity in Saline County, which reached an all time high almost a year ago following discovery of the prolific Waltersburg sandstone lens in the Eldorado area, has begun to fall off, but the county is still one of the most active in the state.

Extensions were completed to the following pools in January: Albion East in Edwards County, Dale Consolidated in Hamilton County, Oak Point in Jasper County (this pool was previously wholly within Clark County), Eldorado West in Saline County, Crossville West and Roland Consolidated in Richland County, Gards Point in Wabash County, and Clay City Consolidated in Wayne County.

New pays discovered in January include the Palestine sandstone in Eldorado West and the Aux Vases sandstone in Harco East, both in Saline County; the McClosky limestone in two pools, Toliver East in Clay County and Crossville West in White County; the lower Ohara limestone in Akin in Franklin County; and the St. Louis limestone in Divide West in Jefferson County.

## PACIFIC COAST

### CALIFORNIA

### Drilling Increases at Santa Fe Springs

Increased drilling activity at Santa Fe Springs field was beginning to shape up. General Petroleum Corp. started things off with completion of the 10,640-ft., 243 Santa Fe for a new deeper pool discovery recently. It was

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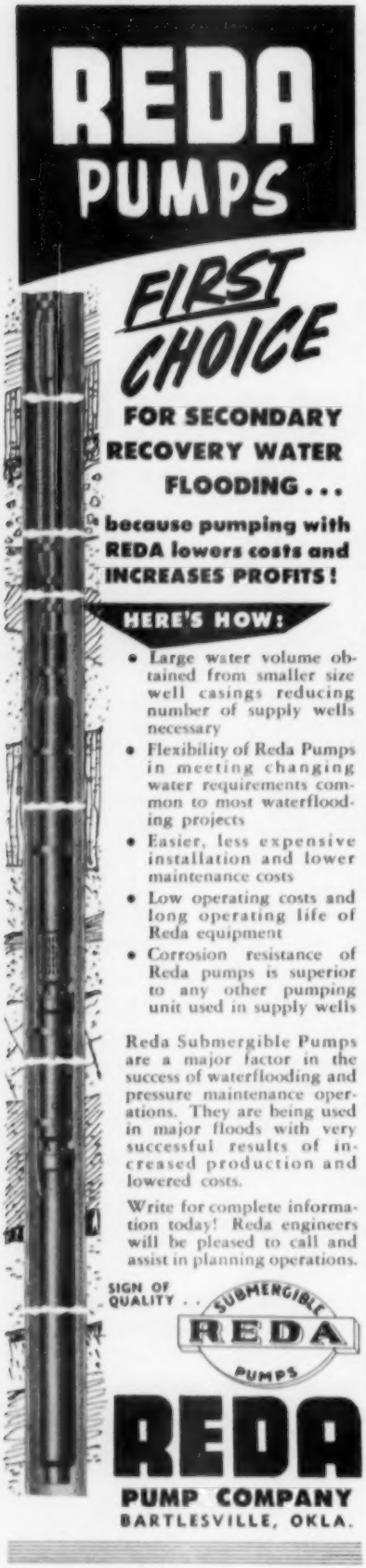
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completed for initial production of 1,776 bbl. daily of 30.9°-gravity crude from the interval 8,524-9,010 ft.

Bandini Petroleum Co. was preparing a drill site about 1,500 ft. northeast of the discovery. General Petroleum Corp. was setting up three offset sites for tests to the deep zone. Universal Consolidated Oil Co. holds an interest with Occidental Petroleum Corp. on 15 acres, 1,000 ft. southwest of 243 Santa Fe and can be expected to get into the play as soon as possible. All told 10 companies, besides General Petroleum Corp., hold acreage within ¼ mile of the discovery.

## Richfield Drilling Ahead At Coal Oil Point Well

Richfield Oil Corp. was drilling ahead at 1,612 ft. on the second redrill of the first test of a 3,800 acre tidelands lease offshore from Coal Oil Point, Santa Barbara County, Richfield acting as operator for Honolulu Oil Corp., Signal Oil & Gas Co., and itself took this test to 6,660 and 6,399 ft. on previous drillings from an onshore site before plugging back for this latest redrill.

## Mitchell Zone Well Finaled at Mountain View

After four dry holes Fred Miller has successfully completed 2 Mitchell in the basal Miocene Mitchell Zone on the southeast edge of Mountain View field in Kern County. Production from this 6,988 ft. extension test is lower than any other producer in this area. The well was completed flowing 150 bbl. daily of 36°-gravity crude through a 12/64-in. choke the well site is located NW SE 15-31s-29e.

# GULF COAST

### SOUTH LOUISIANA

## Deeper Pay Produces In Branch Field Discovery

Union Oil & Gas Corp. and Pan American Production Co. are opening another gas-condensate reservoir in the Branch area, Acadia Parish. The new zone, perforated at 14,780-84 ft., is the deepest in the area. The well, 1-B Guenp, was drilled to 15,648 ft., the greatest depth penetrated so far. The well's initial flow, through adjustable chokes, was estimated at 6,000,000 cu. ft. per day with pressure of 9,000 psi. Shut-in pressure is 10,000 psi.

Union Sulphur Co., predecessor of Union Oil & Gas Corp., discovered the field in 1942. Seven wells have been completed with production from four main zones, ranging in depth from 9,900 to 12,000 ft.

Union is following this discovery with the starting of another 15,000-ft. exploratory test on its West Branch prospect, northwest of Branch field, and between it and Sunray Mid-Continent Oil Co.'s Northwest Branch field.

## Amelia Extension Closing East Lake Palourde Gap

Last week's extension of Assumption Parish's Amelia field marks a step toward a possible linking of that field with East Lake Palourde field, less than 3 miles northwest.

The Amelia extension was by Atlantic Refining Co. at its 1 Amelia Gas Unit 5, in 65-16s-14e, about 1 mile north of the closest of Amelia's three producing gas-condensate wells.

Atlantic's well is productive from casing-perforated interval at 14,190-14,200 ft. Completion flow, through ¼-in. choke, was at the rate of 258 bbl. of 59°-gravity condensate and 4,700,000 cu. ft. of gas per day. Flow was under pressure of 3,300 psi. Total depth is 14,454 ft.

Amelia was discovered by M. L. Mayfield in December 1953. Two wells produce from the 14,200-ft. sand. The other is in a 14,100-ft. zone.

East Lake Palourde, discovered by Union Oil Co. of California in March 1954, now has 16 wells with both oil and gas-condensate production from five zones ranging in depth from 12,500 to 13,400 ft.

Drilling is due to get under way soon by Union Oil Co. at another linking test about 3,200 ft. northwest of Atlantic's extension well.

## Two Discoveries Indicated In Active DeQuincy Area

Testing is under way at two indicated oil-discovery wells in the general DeQuincy area, in southwestern Beauregard Parish.

Three miles east of DeQuincy between DeQuincy and Oretta fields, General Crude Oil Co. and associates 2 Lutcher-Moore, in 16-7s-11w, started flowing oil and emulsion at the rate of 96 bbl. per day. Net oil was about 83 bbl. No formation water was reported. Flowing pressure stabilized about 500 psi. after 12 hours. Pay is perforated at 9,193-9,200 ft. in hole drilled to 10,555 ft. Associates of General Crude include Harry Hurt and Tennessee Gas Transmission Co.

The other indicated discovery is by Sunray Mid-Continent Oil Co. at its 1 Lutcher-Moore, in 10-7s-12w, about 4½ miles northwest of General Crude's wildcat. It has promising oil showings in sands above 9,010 ft., bottom of

the oil string. Total depth is 9,020 ft. The well is cleaning with no estimates on productivity.

### TEXAS GULF COAST

## Gilbert Ranch Extender Makes Prolific Producer

Clegg & Hunt have completed what is rated as the largest well in the Gilbert Ranch area, 15 miles southwest of Beaumont, in Jefferson County. It is their 2 Nona Mills with an estimated open-flow potential of 200,000,000 cu. ft. of gas per day. Yielding 17½ bbl. of 54°-gravity condensate per 1,000,000 cu. ft., estimated open-flow fluid production would be 3,500 bbl. per day. Shut-in pressure is 3,064 psi.

Production is from casing-perforated interval at 10,356-96 ft. in hole drilled to 10,600 ft.

The well extends production of the field about 1¾ miles northwest. Twelve wells have been completed in the field, discovered in June 1945. Main production is from 8,600-8,700-ft. sands.

## Southwest DeWitt County Adds New Producing Area

Tide Water Associated Oil Co. is opening a new productive area 3¼ miles southeast of Nordheim, in southwestern DeWitt County. Its discovery well, 1 Ganzow, is rated good for 3,050,000 cu. ft. of gas per day, open flow. On tests through ⅝-in. choke, it flowed at the rate of 1,598,000 cu. ft. of gas per day with pressure of 1,850 psi. Gas-liquid ratio was measured at 47,000 cu. ft. per barrel. Gravity of the liquid is 63.8°. Shut-in pressure is 2,394 psi. Location is about 1 mile southwest of the small Warmley area.

# SOUTHWEST TEXAS

## Edwards Produces Gas In LaSalle County Discovery

Edwards lime, principal objective in spreading deep exploration along the southwestern extension of the Balcones fault trend through LaSalle and McMullen countries, has proved productive in another LaSalle County wildcat.

The new deep production is in Stanolind Oil & Gas Co. 1 Cooke, in the E. A. Hicks Survey, 15 miles northeast of Stuart City, in the southwestern part of the county. Production is dry gas with open-flow potential placed at 8,500,000 cu. ft. per day. Flowing pressure through ¼-in. choke was 2,284 psi.

Edwards pay is perforated at 10,286-10,326 ft. Hole is plugged back to 10,400 ft. from original total depth of 10,815 ft.

## Dimmit Discovery Completed

Pronto Drilling Co. has a new Olmos oil-discovery well in northwestern Dimmit County. It is at 1 Eardley estate, 5 miles northwest of Carrizo Springs, in the E. A. McCorquadale Survey. Initial production by pump agitation was 27 bbl. of 31°-gravity oil per day.

## Starr Gets New Hockley Field

"Appell Hockley" is proposed as the name of the new field opened by Appell Drilling Co. with the completion of its 1 Simpson, a wildcat 15 miles northeast of Rio Grande City, in Starr County, on the Mexican border. Discovery well flowed 51.04 bbl. of 45°-gravity oil per day on completion gage through 7/32-in. choke from sand at 4,141-45 ft.

## West Texas Discovery Map

Southwest Mapping Co., Continental Life Building, Fort Worth, has issued its West Texas Discovery Map for 1955. For the modest price of $1 this desk-size map shows at a glance all the new pools and new pays opened during 1955. New discoveries are


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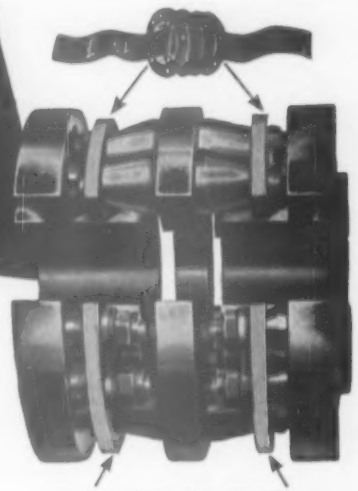

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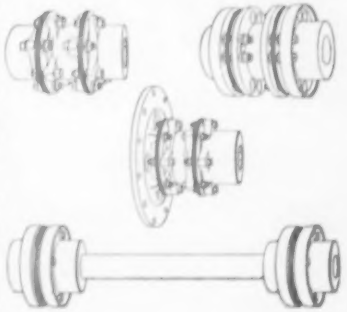

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printed in red and old producing areas are in gray.

Area covered by the map includes Southeast New Mexico, West Texas and a portion of West Central Texas. Data includes counties, fields, geological basins and platforms, and principal towns.

## ROCKY MOUNTAIN

### MONTANA

### California Reports Hourly Flow at Bredette Extension

The extension well to the Bredette area in Roosevelt County flowed oil at the rate of 19 bbl. hourly on drill-stem test of the MacGowan zone-Madison at 6,547-57 ft. The well, The California Co. 1 Rasmusen, C NE NW 13-32n-49e, is the third well in this field.

The Bredette area was opened to production early last year at the 1 Grimm in C NE SE 13-32n-49e. The discovery well, which flowed 140 bbl. per day on ⅛-in. choke, was the first discovery of note in the Williston basin in 1955.

The second well in the field was drilled by Sinclair at 1 Miller in C SW NE 13-32n-49e, as a northwest offset to the 1 Grimm. It flowed 504 bbl. of oil per day on ½-in. choke.

### Good Flow Reported at Clarks Fork Discovery

The Clarks Fork area discovery in Carbon County gaged 338 bbl. of oil per day on tests of the Pryor-Lakota sand at 8,940-50 ft. The strike is British-American Oil Producing Co. 1 State in C NW SE 16-9s-22e.

The well was taken to the Madison lime at 10,877 ft. There were no shows of note reported below the Lakota zone. Location of the new pool is 2 miles northwest of Clarks Fork field. Testing continues.

**Cupton . . .** Rothschild Oil Co. completed the second well at Fallon County's Cupton field on the east flank of the Cedar Creek anticline.

The 24-15 Northwest Improvement, C SE SW 15-9n-59e, was finaled for an initial pump gage of 73 bbl. per day from Red River-Ordovician perforations at 9,308-9,504 ft.

### Resources of Rockies to Be Discussed at Meeting

Twenty-two experts on the geology of the Rocky Mountains have accepted invitations to speak at the area's largest oil, gas, and uranium exploration meeting, to be held in Denver, February 27, 28, and 29.

Their planned discussions already have attracted advance registrations from throughout the country because of growing interest in resources of this region. As a result, Convention Chairman Laurence Brundall, of Denver, expects more than 2,500 at the meeting —the sixth annual convention of the Rocky Mountain section of the American Association of Petroleum Geologists.

Tours and the most complete exhibits of services and equipment in Denver oil history will feature the first day. Business sessions will be held in Denver City Auditorium, February 28 and 29.

The speakers include top experts in their areas and specialties. They will discuss the earth movements which created the Rockies, and the rich pattern of resources which these movements provided.

The program:

**February 28**

Dr. D. L. Blackstone, Jr., professor, department of geology, University of Wyoming, Laramie, "Introduction to the Tectonics of the Rocky Mountain Region."

Dr. L. A. Warner, geology department,

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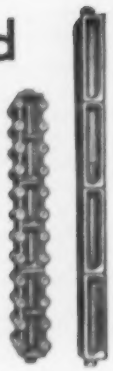

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University of Colorado, Boulder, "Tectonics of the Colorado Front Range."

Gene L. Shaw, American Stratigraphic Co., Denver, "Tectonics of the Raton Basin, with Special Reference to the Late Paleozoic."

Dr. John Paul Gries, professor, South Dakota School of Mines, Rapid City, "Black Hills Tectonics."

James O. Staggs, McAlester Fuel Co., Billings, Mont., "Tectonics of Central Montana."

W. B. Gallup, Royalite Oil Co., Ltd., Calgary, Alta., "Tectonics Features of the Plains of Southern Alberta."

G. M. Knebel, Standard Oil Co. (N.J.), New York City, "Future of A.A.P.G." and "The Habitat of Some Oil."

Raymond M. Thompson, consultant, Denver, "Tectonics of Central Wyoming."

Phil A. Mundt, Mobil Producing Co., Billings, Mont., "Paleotectonic Control of Carboniferous Sedimentation in Central Montana."

Gregory K. Elias, Gulf Oil Corp., Durango, Colo., "Tectonics of the Paradox Basin."

**February 29**

Dr. Vincent C. Kelly, department of geology, University of New Mexico, Albuquerque, "Tectonics of the Colorado Plateau."

Dr. W. Lee Stokes, department of geology, University of Utah, Salt Lake City, "Tectonics of the Wasatch Plateau and Nearby Areas."

Dr. W. W. Mallory, Phillips Petroleum Co., Denver, "Tectonic Department of the Cordilleran Region."

A. J. Eardley, department of geology, University of Utah, Salt Lake City, "Tectonics of the Wyoming Thrust Belt."

Howard Ritzma, Southern California Petroleum Corp., Denver, "Structural Development of the Eastern Uinta Mountains and Vicinity."

George R. Downs, consultant, Denver, "Oil Producing Structures as Related to Major Tectonic Features in the Rocky Mountain Area."

Henry H. R. Sharkey, Carter Oil Co., Denver, "Structural Control of Oil Fields in the Wind River Basin, Wyoming."

Ross E. Wells, Thurman consultants, Denver, "Igneous Tectonics of Slater Dome, Moffat County, Colorado."

Wallace G. Bell, Gulf Oil Corp., Casper, Wyo., "Tectonic Setting of Happy Springs and Nearby Structures in the Sweetwater Uplift Area, Wyoming."

Donald L. Everhart, USAEC, Denver, "Tectonic Control of Uranium Deposits in the Rocky Mountain Region."

W. W. Isachsen, USAEC, Grand Junction, Colo., "Regional Influence of Tectonics on Uranium Occurrences in the Colorado Plateau Area."

James Gilluly, USGS, Denver, "Summary and Recapitulation."

## WESTERN CANADA

### SASKATCHEWAN

### Charles Discovery Hinted At Weyburn Area Wildcat

A well in the Weyburn area of southeast Saskatchewan being drilled by New Gas Exploration of Alberta, Ltd., has encountered an oil column in the Charles zone of the Mississippian limestone formation and is currently carrying out further drill-stem operations in that zone.

The well that gave promise of production, New Gas Exploration 1 Weyburn, on LSD 1, 18-7-12w2, is 5 miles east of production in Ralph oil field area and 10 miles northwest of Midale oil field.

Some salt water was recovered during first successful test in the Charles, bottomed at 4,421 ft., but a later test, with the lower packer set at 4,436 ft. gave a 75-ft. oil recovery along with 240 ft. of oil-cut mud, no water. Latest reported test, bottomed at 4,446 ft. gave a recovery of oil, muddy oil, and salt water.

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ALBERTA

## Red Earth Discovery Looms as Year's Best

A well in the northern sector of Alberta, in the Red Earth Creek area, which appears to be the most significant strike in some time, flowed oil on three consecutive drill-stem tests run in the granite wash horizon. Alberta's new discovery, is situated 80 miles east-northeast of Peace River town 120 miles northeast of the Peace River area's largest proven oil field area in the Sturgeon Lake area and 220 miles north-northwest of Edmonton.

Initial drill-stem test in the zone, of the interval 4,740 to 4,765 ft. flowed oil to the surface in 15 minutes and recorded a pipe recovery of 3,595 ft. of clean oil while the other tests, run down to the 4,797 ft., also flowed oil and recoveries of 4,590 ft. and 4,000 ft. of clean oil were recorded respectively. There was no evidence of formation water which has been quite prevalent in other wells in this horizon in the area.

The well, Union 12-17 Red Earth Creek, is on LSD 12, 17-87-8w5, is located 4 miles west-northwest of the Imperial 8-11 Red Earth Creek wildcat abandonment and 60 miles southwest of the Triad 15-16 Iriquois, granite wash discovery well which is currently being production tested.

Extended production tests will also be needed to fully evaluate the new strike, but according to unofficial reports, a major land play which involves between 6-8 million acres situated between the new discovery and the Saskatchewan-Alberta boundary is taking place.

## Light Oil Shows Reported At Eckville Area Wildcat

Hudson's Bay Oil & Gas Co., Ltd., and Richfield Oil Corp. have recorded a very encouraging recovery of light gravity oil during drill-stem test operations in the Viking sand at their current exploratory venture in the Eckville area of Alberta. The well is 23 miles northwest of Red Deer city and 5½ miles south-southwest of Viking oil production in the Gilby area.

This indicated discovery well, Hudson's Bay-Richfield 1 Eckville, LSD 10, 2-40-3w5, yielded a pipe recovery of 300 ft. of clean oil during initial drill-stem test in the Viking sand.

Scheduled as a Devonian test, the well discovered oil during a drill-stem test bottomed at 6,290 ft. flowed gas at the rate of 155,000 cu. ft. daily and gave up a pipe recovery of 300 ft. of clean oil, 90 ft. of muddy oil and 90 ft. of oil and gas-cut mud. Further drill-stem operations are currently being carried out.

## Viking Gas Discovery Reported at Halliday

Canadian Gulf Oil Co. has proved the Viking sand productive of natural gas at its current exploratory driller in the Halliday area of central Alberta, 36 miles east of Drumheller. The company reported results of a single drill-stem test run in the discovery horizon which flowed gas at maximum rate of 3,060,000 cu. ft. daily.

This wholly owned Gulf venture, Gulf 13-11 Halliday, LDS 13, 11-26-14w4, lies 4 miles north-northeast of a capped Lower Cretaceous gas well that was drilled by Amerada Petroleum Corp. and is 5 miles south-southeast of Calvan Consolidated 7-5 Handhills wildcat abandonment.

Discovery drill-stem test was run of the interval 2,910-3,110 ft. for 60 minutes. Natural gas flowed to the surface in 4½ minutes at built up to a rate of 3,060,000 cu. ft. daily. There was no pipe recovery. The remainder of the Viking sand was cored but no further tests were run.

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## Wet Gas Discovered At Homeglen Wildcat

Canadian Gulf Oil Co. has discovered wet gas in the D3 zone of Devonian at a current exploratory test in Homeglen area of central-west Alberta and are currently coring and testing below the initial two drill-stem intervals reported. This new strike is being drilled 29 miles southwest of the Red Deer city limits and lies 5¾ miles northeast of a Cardium sand oil producer in the Garrington area.

This well, Gulf 11 Lanaway, is on LSD 11, 36-45-4w5. During those two initial drill-stem tests natural gas flow rates of up to 3,500,000 cu. ft. daily were recorded.

The most significant fact at the well is that another well, also in the Garrington area, topped the discovery horizon at an elevation 333 ft. below that encountered at the new strike. That well lies 6½ miles south-southwest of the 11 Lanaway discovery hole.

## APPALACHIAN

### PENNSYLVANIA

Woodland Oil & Gas Co., Inc., is starting their spring drilling program, with three exploratory wells. During the past year, Woodland has acquired the former John Ley property in Southwest Township north of Enterprise, Pa. There are 690 acres in this tract, which is a part of the Grand Valley, Goodwill Hill field, adjoining operations of the Quaker State Oil Refining Corp. and C. A. Hufmeister.

About 40 wells have been cleaned out, repaired and many of them electric logged. A new pumping power has been installed. The pressure plant, with a new motor has been put into operation, serving seven pressure intake wells. There is plenty of gas to run machinery and for recycling gas in the oil-bearing formation. Both First sand, and the Venango third sand are productive. Only a small part of their acreage has been drilled heretofore.

R. M. Weaver, drilling contractor of Pleasantville has moved in equipment to drill and take cores from three or more wells. The cores will be analyzed in the Quaker State laboratory. An extensive secondary-recovery program will be carried out, based upon this core drilling, and as conditions may warrant.

### OHIO

A 200-bbl. producer with an estimated 500,000 cu. ft. gas extended the new Jefferson Township, Coshocton County pool a location to the northeast. The completion by Willard Shrider on David Wilhelm, Section 5, logged the Clinton at 3,340-97 ft. with 750 ft. of oil before fracturing.

- Preston et al 2 (5) John Shelton, Section 3, Hopewell Township, Licking County, along the north edge of Flint Ridge field, gaged 260 bbl. with 450,000 cu. ft. gas from Clinton found at 2,847-85 ft. The well filled up 300 ft. before treatment.
- A third gasser, ½ mile to the southwest of the discovery, was found in York Township, Tuscarawas County. The B. T. Simpson 1 J. D. Carbile, Section 15, topped the Berea at 1,089 ft. and finished in sand at 1,143 ft. with a natural gage of 625,000 cu. ft.

### WEST VIRGINIA

In Licking district, Tucker County, West Virginia, Hope Natural Gas Co. No. 9966 T. A. Loughry, wildcat, elevation 1,846 ft., was dry. Chert 4,912-5,065 ft., Oriskany sand 5,120 ft., show of gas 5,103-05 ft., total depth 5,180 ft. The well was first hydrofraced and then shot but the results were unfavorable. Dry Fork district, Randolph County, Nelson W. Taylor, Agt., 1 H. R. Tingler, is drilling at 1,365 ft. Hope Natural Gas Co. 9957 U.S.A., elevation 3,178 ft., recorded the chert at 5,069 ft. and is drilling at 5,135 ft.

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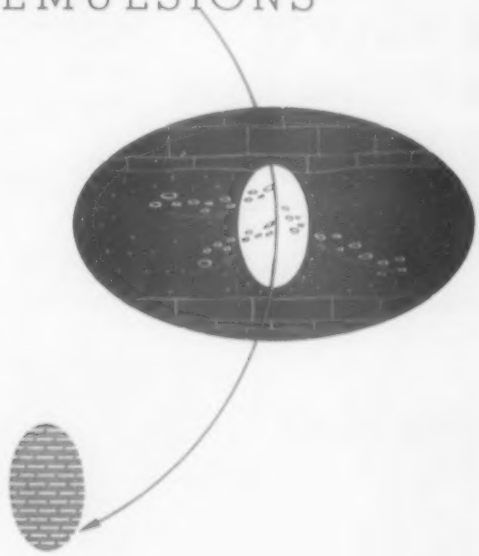

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### EASTERN KENTUCKY

On Beefhide Creek, Pike County, Kentucky West Virginia Gas Co. has completed 6304 William Mullins as a Pennsylvanian Salt sand well at a total depth of 1,739 ft. Productive sand was topped at 1,675 ft. and yielded gas at the rate of 569,000 cu. ft. daily. A 39-hour rock pressure showed 410 psi.

## GREAT LAKES

### MICHIGAN

Two completing Detroit River oil wells in Dorr field, Allegan County, appeared to brighten prospects for important developments in this deeper pay pool in southwestern Michigan. Testing was not conclusive at either.

Louis Zellman 5 B. Zellman, SE SE NE 25-4n-13w, diagonal southeast 20-acre offset to this area's deeper pay discovery, was reported to have pumped and flowed 35 bbl. of oil, plus a small water-cut, after a 2,000-gal. acid treatment at 2,100 ft., total depth. Oil pay showed between 2,094 ft. and the total depth. Well carried about 350 ft. of free oil natural in 24 hours.

Ford Oil Co. 2 Graczyk, SE SW NW 30-4n-12w, another offset in this area, logged first Detroit River porosity at 2,099-2,101 ft., a zone which carried water with some oil, and best pay section 2,104-06 ft. where hole filled 300 ft. with oil in 30 hours, and 125 ft. with water, probably originating from top porosity. This lower pay zone may be a second oil horizon in the Detroit River, below a cap rock separating it from the upper porosity from which most other wells in the area appear to be producing. The 2 Graczyk was acidized with 2,500 gal.

While net oil production after acid treatment had not been calculated, well appeared to be responding very satisfactorily. Ford acidized its 1 Graczyk, NW SW NW 30-4n-12, with 2,000-gal. and production was boosted from an average of 8 bbl. of oil, plus some water, to an average of 25 bbl. of oil and 3 bbl. of water a day.

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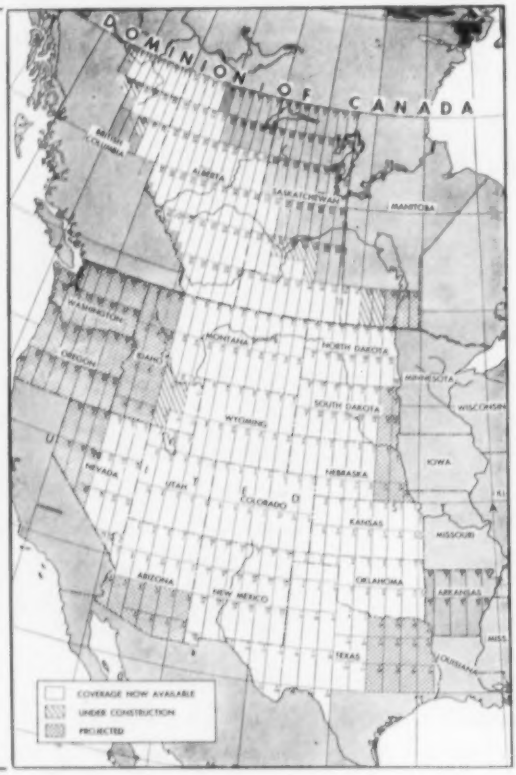



## Successful Wildcats

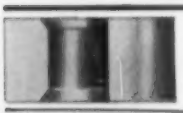
### ALBERTA

Triad 15-16 Iriquois, LSD 15, 16-75-19w5. TD 7,857 ft. Granite wash oil well.

Merrill-Cities Service 11-16 Goodwin Lake, LSD 11, 16-59-13w5. Indicated basal Blairmore gas well.

Gulf 10 Sachs, LSD 10, 36-43-1w5. TD 8,290 ft. PBTD 3,475 ft. Indicated Belly River oil well.

Okalta 10-11 Sedalia, LSD 10, 11-30-5w4. TD 3,140 ft. Indicated gas well.



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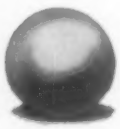

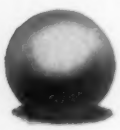

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### KANSAS

Barber County: Adair and Carter 1 Blunk, SW SW NW 30-34s-13w. IP 5,200 M.c.f. of gas per day, Mississippi. TD 4,753 ft. (Opens Blunk pool.)

Aylward Drilling Co. 1 Donovan, SW SW SE 1-34s-13w. IP 54,000 M.c.f. of gas per day, Mississippi. TD 4,733 ft. (Opens Driftwood pool.)

Comanche County: Pure Oil Co. 1 Hazel Beals, C NE NW 5-34s-17w. IP 3,500 M.c.f. of gas per day, Lansing. TD 5,940 ft. (Opens Beals pool.)

Cowley County: F. W. Strait 1 Rauckman, NE NE SW 18-34s-3e. IP 25 BOPD, Bartlesville sand. TD 3,392 ft. (Opens Rauckman pool.)

W. M. Pitts 1 Warren, C S½ SW NW 15-35s-5e. Completing in Mississippi. TD 3,178 ft. (Opens Kanok pool.)

Edwards County: F. Kirk Johnson 1 Salser, SW SW NW 12-26s-16w. IP 37 BOPD Mississippi. TD 4,765 ft. (Opens Salser pool.)

Ellis County: Osage Oil Co. 1 Schumacher, SW SW NW 3-12s-18w. Completing in Lansing. TD 3,751 ft. (Opens Northwest Walter pool.)

Osage 1 Herklotz, SW SW NE 28-15s-18w. Completing in Lansing. TD 3,526 ft. (Opens Scheenchen Townsite pool.)

Graham County: Petroleum, Inc. 1 Goddard, NE NW NW 22-9s-23w. Completing in Lansing. TD 4,245 ft. (Opens Evergreen pool.)

Harper County: Rupp-Ferguson 1 Miller, SW SW SW 2-31s-9w. Completing in Mississippi. TD 4,530 ft. (Opens South Sunny View pool.)

Kingman County: Aurora Gasoline Corp. 1 Greenleaf, NE NE NE 7-28s-6w. Completing in Mississippi. TD 4,410 ft. (Opens Georgia Spur pool.)

Marion County: E. K. Carey 1 Warkentein, SW SW SE 7-21s-3w. Draw down potential 3,000 BOPD, Hunton lime. TD 2,818 ft. (Opens Southwest Unger pool.)

Ness County: Welch & Olsson 1 Moore, NW NW SW 34-19s-21w. Swabbed 5 BOPH, Mississippi. Oil decreased and well is abandoned. TD 4,430 ft. (Opens Wellmanville pool.)

Rush County: Ben Brack 1 Weber, SW SW NE 32-19s-16w. IP 50 BOPD, Arbuckle. TD 3,822 ft. (Opens West Ryan pool.)

Stafford County: Lauck and Sunray 1 Fergus, NW NW SW 23-24s-15w. Completing in Kinderhook. TD 4,465 ft. (Opens North Farmington pool.)

1 Smith, SW SW SW 16-24s-14w. IP 172 BOPD, Arbuckle. TD 4,301 ft. (Opens Dillwin pool.)

### SOUTH LOUISIANA

Acadia Parish: Vincent & Welch, Inc., 1 Clement, 49-9s-2w (1 mile north of Jennings production). IP 161.5 BOPD, ⅛-in., 31.7°, GOR 951 cu. ft. per bbl., perforations 8,949-59 ft. TD 9,239 ft. (Extension and new pay—Jennings field.)

John D. Paret 1 Leonards, 29-7s-1e. IP 42 BOPD, 5/32-in., 26°, perforations 4,482-89 ft. TD 4,560 ft. (New pay in South Bayou Mallet field.)

Cameron Parish: Nichols Oil & Gas Co. 1 Miami Corp., 33-12s-8w. IP 288 BOPD, 5/32-in., 38°, GOR 287 cu. ft. per barrel, perforations 9,665-67 ft. TD 10,024 ft. (New field—2¾ miles southeast Big Lake production.)

Continental Oil Co. 1-A State Lease 1,200, Blk 62, East Cameron area, Gulf of Mexico. IP 3,090 M.c.f. daily, 5/32-in., dry gas, perforations 7,638-48 ft. and 7,654-68 ft. TD 10,523 ft. (New offshore field.)

Jefferson Davis Parish: Pan American Production Co. and Austral Oil Exploration Co., Inc., 1 Amanda Fontenot, 27-11s-5w. IP 3,050 M.c.f. daily, $\frac{7}{32}$-in., GCR 50 M.c.f. per bbl., 52.4°, perforations 9,900-21 ft. TD 13,500 ft. (Extends South Thornwell area.)

Vermilion Parish: Pano Tech Exploration Co. 1 Theall, 2-14s-2w. IP 2,856 M.c.f. daily and 30 BCPD, 5/32-in., 42.6°, perforations 11,580-93 ft. TD 11,775 ft. (New field—4¾ miles northwest Live Oak field.)

### MICHIGAN

Mecosta County: O'Neill Oil Co. 1 Larson, SE SE SW 17-13n-9w. IPP 8 BOPD, Reed City zone pay 3,582-86 and 3,594-3,604 ft. TD 3,708 ft. (New pool.)

### NEBRASKA

Kimball County: Murfin & Sutton, Central Oil Co. 1 Baltensperger, C SE SE 14-13n-57w. IPP 244 BOPD, "J" sand discovery, new field. TD 7,040 ft. Skull Creek.

### SASKATCHEWAN

Imperial Canadian Superior 13-26 Hiresh, LSD 13, 26-3-5w2. TD 5,110 ft. Indicated oil well.

Imperial 4-9 Hastings, LSD 4, 9-4-33w1. TD 4,270 ft. Mission Canyon oil well.

Tide Water 2-9 East Dollard Crown, LSD 2, 9-7-19w3. TD 4,812 ft. Jurassic oil well.

Alida 1 Glen Ewen, LSD 5, 28-2-1w2. TD 4,589 ft. Mississippian oil well.

### SOUTHWEST TEXAS

Bexar County: J. D. Collins et al 1 Brown, James Jordon Sur., A-374. IPP 79.2

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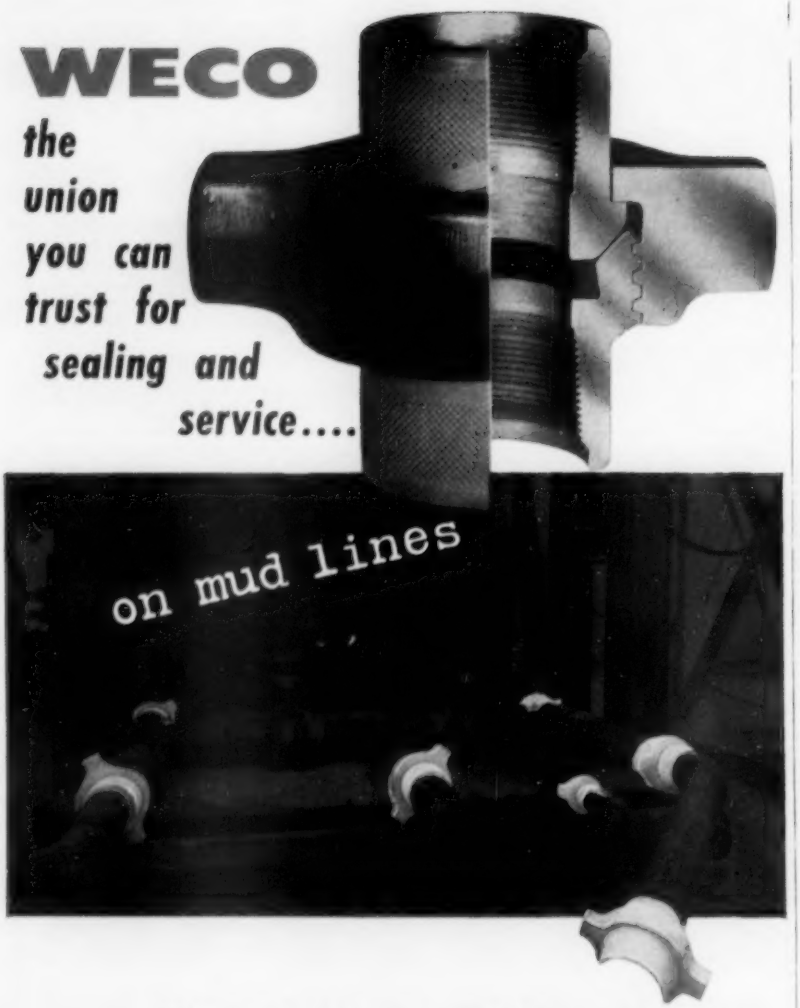


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BOPD, 20°, perforations 1,163-1,213 ft. TD 1,218 ft. (New field.)

Dimmit County: Pronto Drilling Co. 1 A. Eardley estate, E. A. McCorquadale Sur. 6. IPP 28 BOPD (net), 50 per cent water; 31°, perforations 2,217-23 ft. (Olmos). TD 2,241 ft. (New field.)

Jim Wells County: Appell Oil & Gas Corp. 2 Koopman, San Leandro Grant. Shut-in gas well, no gage, perforations 5,976-80 ft. and 5,982-86 ft. TD 5,988 ft. (New pay in Koopman field.)

### TEXAS GULF COAST

Brazoria County: F. A. Callery, Inc., 1-A Munson, Samuel Carter Sur., A-53. IP 3,005 M.c.f. daily, 9 BC per M.M.c.f., 9/64-in., 46.3°, perforations 12,144-48 ft. TD 12,498 ft. (Discovery well Stone field—4,300-ft. west of Bailey's Prairie production.)

Pano Tech Exploration Corp. 1 Rigsbee, Lot 5, Blk. 1, Jesse Thompson field, A-132. IP 392.6 BOPD, 5/32-in., 32.6°, perforations 10,123-35 ft. TD 10,250 ft. (New field—2½ miles northwest of production off northwest flank West Columbia dome.)

Galveston County: Hassie Hunt Trust estate 1 Ghinaudo el al., J. R. Pace Sur. IP 12,000 M.c.f. daily, open-flow potential, GOR 833 M.c.f. per bbl., 52.3°, perforations 10,797-10,802 ft. TD 10,872 ft. (New pay in Alta Loma field.)

Superior Oil Co. 1 Stubbs-Craven Unit, Joseph La Flore Sur., A-14. IP 89 BOPD, ⅛-in., 33.5°, perforations 9,027-30 ft. TD 11,600 ft. (New pay in Algoa field.)

Jackson County: Manco Corp. 1 Babb, R. Solis Sur., A-73. IP 64.38 BOPD (net), P-31 choke, 15 per cent water, 42°, perforations 5,681-84 ft. TD 6,760 ft. (New field.)

Jefferson County: Texas Eastern Production Corp. 1 Marrs McLean estate et al., B. A. Vacocu Sur., A-53. IP 2,500 M.c.f. daily, 3.62 BC per M.M.c.f., $\frac{5}{16}$-in., 54.3°, perforations 8,686-91 ft. TD 12,309 ft. (1 mile south of West Hampshire production.)

Kleberg County: Southern Minerals Corp. 2 State, Tract 380, Laguna de Los Olmos. IP 154.3 BOPD, P-28 choke, 40.1°, perforations 8,007-12 ft. TD 8,503 ft. (New pay in Sarita field.)

### WEST TEXAS

Andrews County: White Eagle Oil Co. 1 Argo Oil Corp., 14-A41-PSL, 14 miles SW Andrews. IP 176 BOPD, 20/64-in., TP 600 psi., GOR 1838, 38.9°, Clear Fork 5,618-5,754 ft. TD 9,390 ft., ground elev. 3,297 ft. Top Clear Fork 5,675 ft., Ellenburger 9,290 ft.

Coke County: Jake L. Hamon 1 Rawlings, 351-1A-H&TC, 3 miles SW Ft. Chadbourne. IP 141 BOPD, 16/64-in., TP 178 psi., GOR 937, 47°, perforated Ellenburger 6,330-35 ft. TD 6,862 ft., elev. 2,143 ft. Ellenburger 6,335 ft., by samples, Cambrian sand 6,836 ft.

Crane County: Gulf Oil Corp. 311 Waddell, 22-B21-PSL, 18 miles NW Crane, new-pay discovery. IP 364 BOPD, ¼-in., TP 1,000 psi., GOR 1647, 36.8°, Tubb 4,400-4,530 ft., TD 5,840 ft.

Crockett County: Slick Oil Co. 1 Friend, Sec. 2½, D. L. Carver Sur., 6 miles S Big Lake. IPP 78 BOPD, 32°, GOR zero, pay 2,318-60 ft. TD 2,750 ft.

Reagan County: W. E. Bakke 1 Continental-University, 7-49-University Lands, 6 miles SE Big Lake. IP 176 BOPD, 9/32-in., TP 365 psi., GOR 435, 32.8°, pay 2,456-92 ft., TD 2,680 ft.

White Eagle Oil Co. 1 Wolters, Sec. 2, Cert. 5036, GC&SF Sur., 2 miles S

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Big Lake. IPP 102 BOPD, 30°, GOR zero, Grayburg pay 2,250 ft. TD 2,604 ft.

Runnels County: Hoblitzelle & Perkins 2 Bryan, Sec. 599, Blk. 33, W. H. Smith Sur., Palo Pinto pay discovery in Norton, North lower Fry field. IPP 54 BOPD, 44°, GOR zero, perforated 3,928-81 ft. TD 4,600 ft.

Scurry County: C. R. Craig 1 Shannon estate, 333-97-H&TC, 8 miles NW Snyder. IPP 85 BOPD, 37°, GOR 220, Glorieta 2,756-62 ft. TD 2,820 ft.

### EAST TEXAS

Cass County: Sam Sklar 2 Williams, Briant Holes Sur., 12 miles S Atlanta, IP 170 BOPD, 3/4-in., 40°, GOR 574, Mitchell sand 6,098-6,103½ ft. TD 6,152 ft.

Marion County: Ohio Oil Co. 1 Moseley, J. P. Francis Sur., A-156, new-pay discovery in Rodessa field, old well worked over. IP 100 BOPD, ⅛-in., TP 330 psi., 44.7°, GOR 995, Hill zone 5,991½-6,001½ ft. TD 6,103 ft.

### WEST CENTRAL TEXAS

Callahan County: Bridwell Oil Co. 1 Griffith, Sec. 42, BAL Sur., 7 miles E Abilene. IP 72.87 BOPD, 10/64-in., TP 1800 psi., 42°, GOR 375, Palo Pinto lime 3,289-92 ft., TD 3,292 ft.

Hack Drilling Co. 1 Pugh Ross, Jr., Sec. 1, Blk. 1, SPRR Sur., 2 miles SE Denton. IP 238.7 BOPD, 14/64-in., TP 185 psi., 41°, GOR 200, Cook sand 1,728-33 ft. TD 1,803 ft.

Coleman County: Frank Pethybridge 1 Mossis estate, Sec. 28, D. B. Austin Sur., 6 miles NE Silver Valley. IP 238 BOPD, 18/64-in., TP 110 psi., 40.8°, GOR 750, Capps lime 2,506-16 ft. TD 2,940 ft. (Corrected operator name and location.)

Comanche County: Bartlett Petroleum Co. 1 Bauer, James Madison Sur. 40, 2½ miles W Sidney. IPP 25 BOPD, 38°, GOR 800, limestone pay 2,218-25 ft. TD 2,270 ft.

Bartlett Petroleum 1 Graham, J. Madison Sur. 40, 3½ miles SW Sidney, IP 30 BOPD, 24/64-in., TP 758 psi., GOR 1800, 36°, lime 2,208-24 ft. TD 2,250 ft.

Eastland County: Roy Parker 1 Hogg, W. H. Sargent Sur., 5 miles NE Desdemona. IPP 15 BOPD, 40°, GOR zero, sand 1,811-17 ft. TD 1,895 ft.

Fisher County: West Central Drilling Co. 1 Weatherby, 5-2-H&TC, 5 miles N Roby. IP 98 BOPD, ¼-in., TP 90 psi., GOR 800, 44°, Cisco sand 3,808-12 ft. TD 3,812 ft.

### NORTH TEXAS

Clay County: G. W. Graham 1 Barnett, W. A. Farris Sur., A-147, 2 miles S Buffalo Springs. IP 128.74 BOPD, 15/64-in., TP 210 psi., 43°, GOR 600, top pay 5,694 ft., perforated 5,700-36 ft. TD 5,784 ft.

Jack County: Herbert S. Woods and associates 2 Hall, E. Moore Sur., A-387, 3 miles NW Maryetta. IP 134 BOPD, 24/64-in., TP 180 psi., GOR 550, 40°, conglomerate 5,536-42 ft. TD 5,620 ft.

Young County: Anderson Oil and associates 1-C Dorian-King, Rebecca Edwards Sur., A-90, 2½ miles SW Newcastle. IP 275 BOPD, 6/64-in., TP 320 psi., 45°, GOR 800, Mississippian 4,538 ft. TD 4,548 ft.

Wesley Stephens 2 Stoffers, Blk. 41, J. A. Driver Sur., A-2073, 10 miles S Graham. IP 200 BOPD, 20/64-in., TP 400 psi., 41°, GOR 1425, Marble Falls conglomerate 4,023-31 ft. TD 4,063 ft.

### WYOMING

Fremont County: Sinclair Oil & Gas Co. 12 Unit, SW SE NE 13-28n-93w. IPP 281 BOPD, fourth Frontier sand discovery, new pay. TD 5,269 ft. Morrison.

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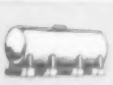
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# . . . Mecom Continuing to Expand

JOHN W. MECOM, one of today's most active independent oil operators, recently took two giant strides to expand his sprawling enterprises.

In Wichita, Kans., he bought the 30-year-old Cardwell Manufacturing Co., maker of drilling rigs and other oilfield equipment. In the Republic of Haiti, he acquired half interest in a big oil concession *(The Oil and Gas Journal, January 23, page 42).*

The two purchasers represented extremes not only geographically but economically as well.

Cardwell Manufacturing Co., with 400 employes, a busy plant, and a long line of reputable products, was a going concern. Haiti's oil prospects, on the other hand, have a reputation based mostly on disappointments.

**No surprise . . .** Mecom's friends long ago ceased being surprised at his sudden and unexpected moves. They learned to expect the unexpected. In Houston, Mecom's home town, they'll give you odds that Haiti soon will be producing oil—Mecom's oil.

He has made a habit of prospering where others have failed. He got his start in the oil business by drilling an 880-ft. test on a farmout which an oil company reportedly was about to abandon as depleted. But Mecom found oil in commercial quantities and gradually revived the lease.

That was in the mid-30's, not long after Mecom had left the University of Oklahoma. After his initial success in the oil business at South Liberty field, Mecom spread out to other sections of the Gulf Coast. He gained a reputation by exploiting tricky old salt domes, looking for oil near where others had failed. Usually he found what he was looking for.

Moving from field to field and salt dome to salt dome, Mecom left a string of producers behind him. His ventures brought discoveries, flank extensions, and revived production at such fields as Hull, Lake Washington, Delta Farms, High Island, Rose City, Esperson, and Houma.

In recent years Mecom has developed large reserves in the deep-oil country along the coast of Louisiana, and he is one of the few independents now producing oil from the Louisiana tidelands.

**Varied interests . . .** Several months ago Mecom purchased in fee more than 250,000 acres of actual and potential oil and gas properties from Mr. and Mrs. H. J. Lutcher Stark, Orange, Tex. The property is scattered over a large section of southern Louisiana. Price was said to be in excess of $15,000,000.

One of Mecom's most interesting current ventures is a one-third participation in the world's deepest well, a 22,570-ft. test south of New Orleans.

His exploration work is scattered over much of the Texas and Louisiana coastal area.

He now employs close to 800 persons, including the 400 on the Cardwell pay roll. He now operates about 20 rigs, some 15 of which are on barges.

Mecom, now in his middle 40s, was born in El Paso and grew up at Liberty, Tex. His father, Harvey Mecom, had been in the oil industry as far back as the Spindletop boom.

After attending high school in Houston, young Mecom studied 1 year at Rice Institute. Then he transferred to the University of Oklahoma where he majored in petroleum engineering. Before going into the oil business on his own, he had behind him several years' experience as a roughneck and driller.

Today, Mecom lives in a big home in the River Oaks section of Houston. His wife, Mary Elizabeth, is unofficial executive vice president of the Mecom interests and spends considerable time in the downtown office. They have a teenage son and two younger daughters.

Vying with oil as Mecom's chief business interest is a far-flung cattle empire. His ranches are near Trinidad, Colo., and Alta Loma, Tex.

The ranches are more than vacation spots for the Mecoms. In the past few years Mecom has built a herd of top-quality Aberdeen Angus cattle with which he is stocking his ranches.

## Personals

**N. C. McGowen,** president of United Gas Corp., Shreveport, has been named chairman of United and its subsidiaries, United Gas Pipe Line Co. and Union Producing Co. **Ed Parkes,** executive vice president of the parent firm, was elected president of both subsidiaries.

**W. J. (Jack) Anderson,** former crude and coking department general foreman at the Standard Oil Co. (Ind.) Sugar Creek, Mo., refinery, has joined Commonwealth Oil Refining Co. as process superintendent at the Ponce, Puerto Rico, plant.

**R. J. Eubank,** chief clerk in Sinclair Pipe Line Co.'s Houston operations district since 1943, has been named assistant district superintendent.

**William W. Henry,** district geologist for Union Oil Co. of California, has been transferred from Corpus Christi to the Southwest Louisiana district at New Orleans.

**H. E. Thompson,** Rocky Mountain operations vice president of Great Lakes Oil & Chemical Co., has resigned to become a Casper, Wyo., lease broker.

**Bob Rist** has been advanced from geologist to district geologist in Monterey Oil Co.'s Louisiana division.

**E. J. Theessen,** area paleontologist for Shell Oil Co., has transferred from Corpus Christi to San Antonio.

**Earl H. Johnson,** manager of crude purchases for Mohawk Petroleum Co., for about a year, has been elected vice president of the Tulsa firm. **Lloyd Kirk,** transportation manager, was named field superintendent and president of Mohawk Equipment Co., and **Virgil Evans,** former office manager, becomes treasurer of both firms.

**James W. Dowden** has been promoted by Lion Oil Co. from geologist in Portland, Ore., to district geologist in Denver.

**James D. Divelbiss,** formerly chief geologist for Chicago Corp., has bought an interest in Petroleum Geophysical Co., Denver, from **Milt Collum** and **Wes Morgan.** Divelbiss will head operations in Oklahoma, Louisiana, Texas, and southeastern areas from Fort Worth offices.

**Hoyt S. Taylor,** secretary and chief engineer of Zapata Off-Shore Oil Co., has been elected a director.

## Personals

**John T. Gray** has been promoted by Continental Oil Co. from division engineer in Wichita to regional engineer in Oklahoma City.

CLEVELAND

**W. B. Cleveland** has been named manager of Creole Petroleum Corp.'s Amuay refinery. He succeeds **Calvin E. Cooper,** who resigned recently. In other changes, **M. G. Ball,** superintendent of the Caripito district, and **F. K. Davis,** assistant manager at Amuay, will swap jobs; **Dr. F. G. Bapista** becomes assistant production manager in Caracas; **G. C. Holcomb,** assistant manager of the geological department, Caracas, temporarily replaces **F. W. Johnson** as manager; and **D. C. Meyer** replaces Holcomb.

**J. H. Karchmer** and **S. O. Brady** have been moved up in Humble Oil & Refining Co.'s research and development division at Baytown, Tex. Karchmer, named research specialist, will deal with electrochemical and chromatographic analyses. Brady, who becomes serior research chemical engineer, will work on air and stream pollution problems.

**T. E. Keefer,** Stanolind Oil & Gas Co. field superintendent in the Luby area near Corpus Christi, Tex., has retired after 34 years with Stanolind and predecessors. He has been succeeded by **F. L. Nelson.**

**Paul R. Warren** has been promoted from assistant regional geologist to regional geologist in Continental Oil Co.'s central region. He succeeds **C. L. Arnett,** who retired February 1 after 24 years' service.

**J. Paul Fly** has been promoted by Magnolia Petroleum Co. from petroleum engineer at Drumright, Okla., to district petroleum engineer in Great Bend, Kans.

**Russell J. Alexander,** geologist for The California Co., has been moved from Pensacola, Fla., to Whittier, Calif.

**Dr. William P. Hettinger, Jr.,** former organic chemistry section leader in the catalysis division of Sinclair Laboratories, Inc., Harvey, Ill., has been promoted to director of the division. He succeeds John W. Teter, who died recently.

**George A. Whitten** has been named assistant to the manager of Texas Gas Corp.'s pipeline department at Winnie, Tex. He will head construction and maintenance. Other appointments: **Jesse Bertrand,** to operations superintendent; and **Donald G. Hall,** to field foreman in the Winnie area operations section.

**Dalton Moore, Jr.,** has resigned as manager - engineer for the Wimberly Field Unit near Abilene, Tex., to become a consultant there.

**C. C. Bratt** has been promoted by Phillips Petroleum Co. from party chief at Pratt, Kans., to geophysical supervisor at Bartlesville, Okla.

**Carroll V. Kroeger,** recently an engineer for Central Indiana Gas Co., at Munice, Ind., has joined Washington Natural Gas Co. as assistant chief design engineer at Seattle.

**Ross Mitchell,** district pipeline foreman for Ohio Fuel Gas Corp. since 1946, has been promoted to southeastern division pipeline superintendent. The division comprises 21 counties in southeastern Ohio.

REYNOLDS

**Phillip G. Reynolds,** Gulf Coast division manager for Rimrock Tidelands, Inc., has left for Israel on his first assignment as general superintendent fo foreign operations. Rimrock will supervise all drilling operations for Matsada United Drilling Co., Ltd., operating subsidiary of Lapidath-Israel Petroleum Co., Ltd. Before joining Rimrock Tidelands, Reynolds spent 18 months in Greece as drilling superintendent for William G. Helis.

**John F. Boyd,** Tidelands Exploration Co., has been elected president of Southeastern Geophysical Society. Boyd succeeds **G. A. Burton,** Shell Oil Co. Others elected: **O. G. Holekamp,** Shell, vice president; **R. E. Halsey,** Sinclair Oil & Gas Co., secretary-treasurer; and **M. G. Frey,** The California Co., and **L. W. Cobena,** The Texas Co., district representatives for 1956.

**R. L. Patton,** former district superintendent in The Texas Co.'s Pacific Coast division, has been named general superintendent of drilling and production in the Rocky Mountain district, Denver. Patton joined Texaco in 1937 as a roustabout. He later became district engineer and assistant district superintendent on the Pacific Coast.

**L. R. (Larry) Seaman,** an officer and director of Intex Oil Co., Bakersfield, Calif, since 1945, has been elected president. He succeeds **L. B. Snedden,** who resigned recently. Other Intex appointments: **John May,** promoted from head of the Mid-Continent division, Dallas, to manager and vice president of exploration; **E. W. Saunders,** geologist at Ventura, Calif., named a director; and **H. E. Rickard,** treasurer, chosen vice president of the firm. Seaman was vice president of Independent Exploration Co., predecessor to Intex. Earlier he had been West Coast manager of British-American Oil Producing Co.

**John H. Douma** has been named operations manager and **M. S. (Steve) Patton, Jr.,** manager of engineering in Sunray Mid-Continent Oil Co.'s production department. Other Sunray changes: **Frank C. Folger, Jr.,** becomes assistant manager of engineering; and **M. Buford Penn** chief unitization engineer in the joint operations department.

**James L. Arthur** has been promoted by Shell Oil Co. from division exploration engineer in Ventura, Calif., to senior exploration engineer in the Los Angeles area office. **Loy M. Carter,** area logging engineer in Los Angeles, has been advanced to division exploration engineer in Bakersfield. **Ivan P. Colburn,** Shell exploration engineer, has been moved from Los Angeles to Ventura. Other exploration transfers: **William L. D'Olier,** from Bakersfield to New Orleans; **H. Duncan English,** Ventura to Bakersfield; **Edward G. Heath,** Los Angeles to Long Beach; **Earl F. Lambert,** Los Angeles to New Orleans; **Charles N. McCullough,** Long Beach to Bakersfield; and **Leonard M. Snyder,** Los Angeles to Salt Lake City.

**Robert Eugene Owen** has resigned from C. L. McMahon, Inc., at Ardmore, Okla., to join Kirkpatrick Oil Co., Oklahoma City, as subsurface geologist.

**George F. Klein, Jr.,** chief engineer for Catalytic Construction Co., Philadelphia, since September, has been named engineering vice president and elected a director. Before joining Catalytic as process engineering manager, Klein was chief engineer for Spencer Chemical Co. Earlier he was with Allied Chemical & Dye Corp., Hercules Powder Co., and chief engineer of Refinery Engineering Co.

## Southern California Engineers Elect Officers

**Herman Schaller, McCullough Tool Co., has been elected chairman of American Institute of Mining, Metallurgical and Petroleum Engineers' Southern California petroleum section. Schaller succeeds Hal Stanier, Sunray Mid-Continent Oil Co., named junior past chairman; The new officers are, seated left to right, F. L. Wadsworth, General Petroleum Corp., senior past chairman; Schaller; J. S. Baker, Lane-Wells Co., vice chairman; Max Taves, Richfield Oil Corp., councilor. Standing left to right are Stanier; C. F. Gallagher, councilor; M. G. Arthur, Union Oil Co., councilor; W. F. Cerini, Union Oil Co., councilor; and F. E. Schoonover, Monterey Oil Co., councilor. Other new councilors not shown are S. A. Patterson, Bankline Oil Co.; H. G. Abadie, Long Beach Oil Development Co., and R. A. Holman, Amerada Petroleum Corp.**

**Charles E. Curry,** vice president and director of Sohio Pipe Line Co., has been named chief design and construction engineer of Sohio Petroleum Co. He will be headquartered in St. Louis.

**Al Sharrick,** exploration manager for Shell Oil Co., will be transferred March 1 from Wichita to Midland, Tex. Before going to Midland, Sharrick will spend 3 months in Shell's offices in The Hague, the Netherlands.

**Dr. Rush F. McLearly** has resigned as chemical research supervisor for The Texas Co. to join Jefferson Chemical Co., Inc., as general manager of the research and development department. Jefferson is a subsidiary of American Cyanamid Co.

**L. C. Gravis** has given up his post as division regional geologist for Gulf Oil Corp. at Houston to devote full time to managing exploration in the offshore zone. In other changes in Gulf's Houston production division **J. A. Tierney** moves up from zone geologist at Shreveport to division staff geologist at Houston; **W. D. Siple** succeeds Tierney; **J. L. Nichols** replaces Siple as zone regional geologist, Shreveport; **L. Z. Franz** takes Nichols' post as zone subsurface geologist in Shreveport; **W. B. Fulton, Jr.,** moves from assistant zone subsurface geologist at New Orleans to replace Franz. **R. E. Hudspeth** moves from Houston to succeed Fulton.

**Homer C. Wilson** and **T. H. Pierson** have been named to major posts at Texas Butadiene & Chemical Corp.'s new plant going up near Channelview, Tex. Wilson, until January manager of Celanese Corp. of America's Petrocel subsidiary, becomes director of supplies. Pierson, former vice president of Eggelhof Engineers, Houston, will be chief engineer at the new plant.

**Nelson Puett,** member of the Federal Petroleum Board in Kilgore, Tex., since 1952, has been named board chairman. He succeeds **Leo Hart,** who resigned February 1 because of ill health. Puett was an examiner in Connally Act administration work 15 years.

## Personals

**C. A. Wright,** executive committee chairman of Freeport Sulphur Co., New York, has been named chairman of Freeport Oil Co., recently formed to handle oil and gas operations of the parent company. Other new officers are **H. C. Peterson,** New Orleans, president, and **C. M. Sampson, C. G. Cary,** and **D. D. Utterback,** all of New Orleans, vice presidents and directors. Freeport has been in the oil and gas business since 1949, and now has 2,500 bbl. daily production. The firm owns one-third of the world's deepest well in southern Louisiana.

**Jack R. Fraser,** formerly with Shell Oil Co., has joined Republic Natural Gas Co. as senior petroleum engineer in Dallas. **Dan N. Bailey** joins the firm as junior petroleum engineer in the Hugoton district.

**John C. Horning,** former assistant manager of Leonard Pipe Line Co., has been named manager of field operations for Leonard Crude Oil Co., Alma, Mich. **David W. Dolson,** who has been vice president for crude-oil procurement of Mid-West Refineries, Inc., was named to manage crude-oil procurement and sales. Other changes at Leonard Crude: **Gerald Watson,** former acting superintendent and engineer for Leonard's Simrall division, named assistant manager of field operations; **D. L. DeGraw,** promoted from Simrall superintendent in the northwestern division to superintendent for Leonard in the same area; **Floyd Humes,** former Alma-Crystal district superintendent for Leonard Pipe Line Co., named new southern division superintendent; and **Delmar Allen,** moved from pipeline company field foreman to Northeastern division superintendent.

## DEATHS

**Joseph F. Cook,** 81, retired globe-trotting drilling instructor, and pioneer Oklahoma contractor, died February 8 in Coffeyville, Kans. Cook began drilling in Oklahoma in 1904 on a lease near Barnsdall, living near there until he retired in 1953. He taught his trade abroad through a U. S. Government lending program.

**Dr. Robert Logan Hewitt,** chief geologist for Trice Oil & Gas Co., Bakersfield, Calif., died recently. He was 47.

**C. F. Martin,** 59, purchasing agent for Northern Natural Gas Co., died February 15 in an Omaha hospital.

**Commodore William G. Greenman,** USN (ret.), director of naval petroleum reserves from 1944 to 1950, died February 8 in Honolulu.

**Dennis F. McCarthy,** 67, former vice president and general manager of A. O. Smith Corp. of Texas and manager of the firm's tubular products division at Milwaukee, died there recently.

**W. M. Gaston, 59,** vice president of North American Geophysical Co., died recently in Houston. He had been active in Houston oil business 30 years.

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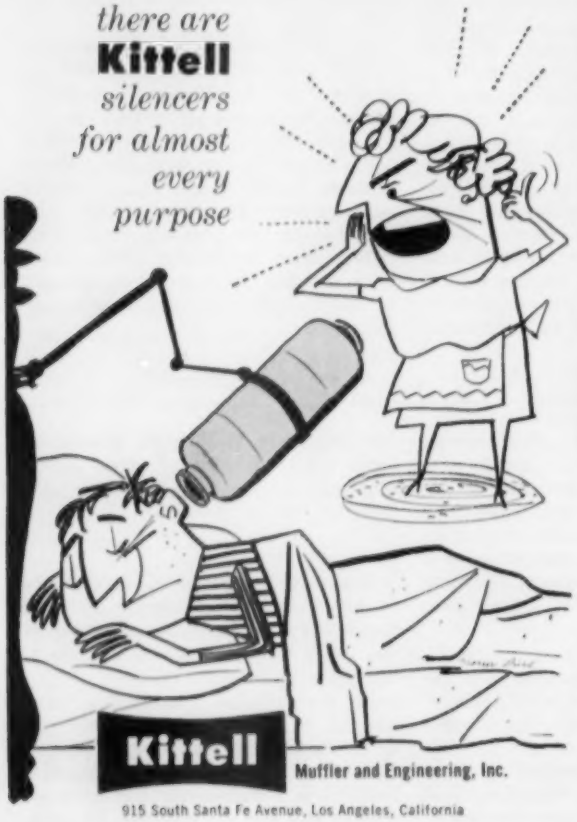

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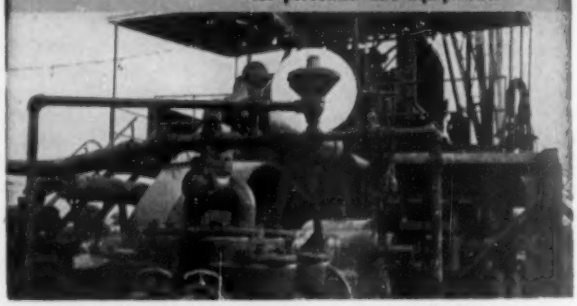

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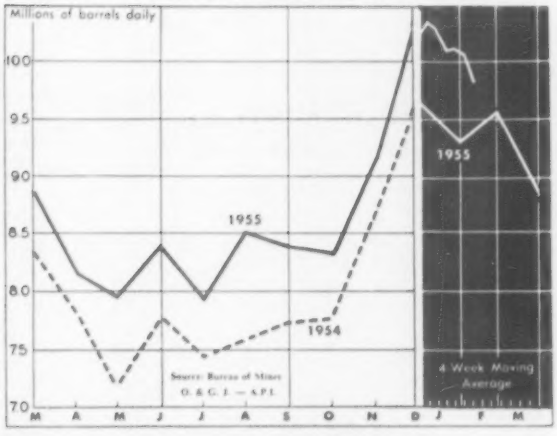
# Latest Figures . . . Industry Trends

## A QUICK LOOK AT THE HIGHLIGHTS

| | LATEST WEEK | Change from WEEK AGO | | Change from YEAR AGO | |
|---|---|---|---|---|---|
| Production | 7,060,610 | DOWN | 11,450 | UP | 218,721 |
| Crude stocks | 258,210,000 | DOWN | 196,000 | DOWN | 1,934,000 |
| Completions | 1,227 | UP | 173 | UP | 335 |
| Refinery runs | 8,016,000 | DOWN | 52,000 | UP | 632,000 |
| Gasoline stocks | 187,618,000 | UP | 4,962,000 | UP | 13,415,000 |
| Kerosine stocks | 20,069,000 | DOWN | 288,000 | DOWN | 1,369,000 |
| Distillate stocks | 80,569,000 | DOWN | 3,661,000 | UP | 4,411,000 |
| Residual stocks | 37,727,000 | DOWN | 843,000 | DOWN | 8,962,000 |
| Four-product stocks | 325,983,000 | UP | 170,000 | UP | 7,495,000 |
| Total imports | 1,369,200 | DOWN | 38,800 | UP | 20,200 |

TOTAL DEMAND – ALL OILS




## Seasonal Decreases in Demand Call for Lower Refinery Runs

CRUDE prices have changed in California and in the Middle East. The California change is related to the over-all shortage of residual fuel while the shifts in the Middle East were made necessary by recent changes in tanker rates.

The price increases in California were for the heavier crudes. Postings for 15°-gravity-or-heavier crudes were raised 5 cents a barrel with smaller increases for lighter crudes up to 26° gravity. This is the second raise for heavy California crudes in less than 4 months. The other change was effective October 17, 1955, when the increase was 10 cents a barrel for 18° gravity or heavier. In this case, the increases were applicable only through 25°-25.9°.

Price quotations for Middle East crude were adjusted to cover some of the recent changes in tanker rates. In general, prices for crude loaded in the Persian Gulf were cut about 5 cents a barrel while prices on East Mediterranean loadings were raised 7 to 10 cents a barrel.

**Total demand will be down in March . . .** Gasoline demand normally hits the low point for the year in January with very little improvement in February. Even in March the gain by gasoline is more than offset by decreases in demand for burning oils.

These monthly trends in demand are shown in the table at the bottom of the page. In this table, averages were calculated for monthly demand for the years 1948-55. (Figures for 1952 were not included since the refinery strike of that year tended to distort the demand pattern for the early summer months.) Average demands for entire previous years were calculated and the monthly averages expressed as percentages of the average for the previous full year.

Note in the table that January demand for all oils shows up as 110.9. This means that for the postwar period, total demand in January of the average year was 110.9 per cent of the average for the entire previous year. For a normal year, total demand will drop below the previous year's average only in May and July.

Demand for petroleum products will be lower each month through May with very little change in the total through October. The big seasonal increases come in November and December. Note that October demand is only 2.7 per cent greater than average demand for previous year.

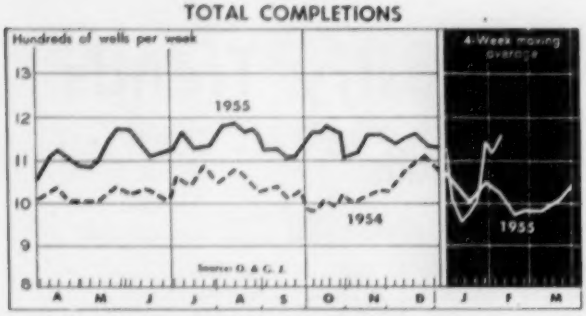
This downward trend by total demand in the first 5 months of the year calls for some reduction in refinery runs and product imports. A little closer tailoring of refinery operations to fit seasonal changes in demand will go a long way toward relieving pressures on product markets.

SEASONAL CHANGES IN DEMAND—1948-55*

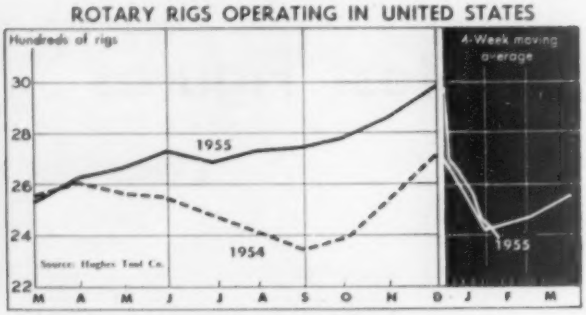
| | Total demand | | | |
|---|---|---|---|---|
| | All oils | Gasoline | Middle distillate | Refinery runs |
| December of previous year | 112.4 | 96.4 | 154.9 | 103.3 |
| January | 110.9 | 90.2 | 160.9 | 105.1 |
| February | 109.8 | 92.8 | 150.2 | 105.1 |
| March | 107.3 | 100.5 | 127.7 | 104.0 |
| April | 101.3 | 107.7 | 92.3 | 101.5 |
| May | 97.2 | 111.0 | 72.1 | 104.8 |
| June | 101.1 | 118.1 | 69.9 | 105.7 |
| July | 98.6 | 114.7 | 68.9 | 106.2 |
| August | 102.2 | 115.5 | 75.8 | 106.9 |
| September | 102.2 | 112.2 | 84.0 | 106.4 |
| October | 102.7 | 109.7 | 92.2 | 106.0 |
| November | 111.0 | 107.2 | 128.1 | 107.5 |
| December | 120.0 | 103.2 | 169.9 | 109.1 |

*Daily average demand by months for period 1948-55, expressed as per cent of daily average for entire previous year.

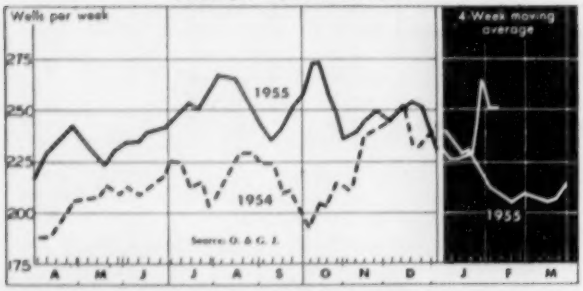
TOTAL COMPLETIONS




ROTARY RIGS OPERATING IN UNITED STATES




WILDCAT COMPLETIONS




ACTIVE ROTARY RIGS*

| Area— | 2-13-56 | Change from 2-6-56 | Change from 2-14-55 |
|---|---|---|---|
| Gulf Coast | 612 | —32 | 93 |
| N. and W. Texas-New Mexico | 821 | 21 | —3 |
| Arkansas-N. Louisiana-E. Texas | 144 | | —27 |
| Oklahoma | 268 | 4 | —27 |
| Kansas-S. Nebraska | 166 | 11 | —2 |
| Illinois-Eastern | 78 | —27 | —45 |
| Rocky Mountain | 179 | —3 | —15 |
| Pacific Coast | 127 | —6 | —14 |
| Total United States | 2,395 | —32 | —40 |
| Western Canada | 224 | 15 | 29 |

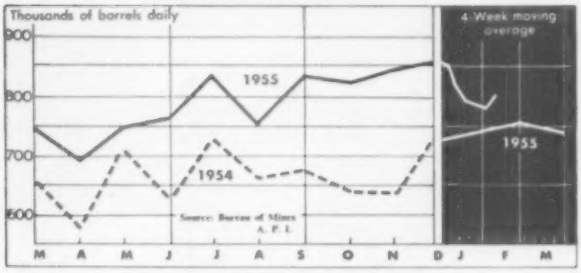
*Hughes Tool Co.

## WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 11, 1956

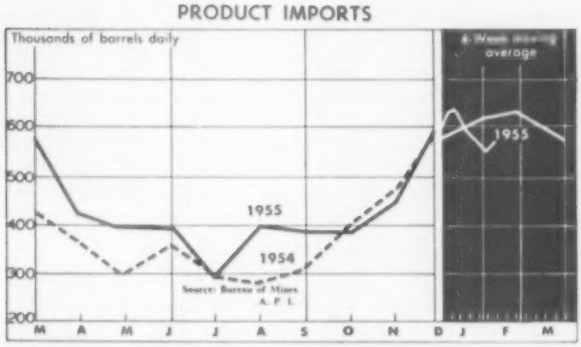
| | Total of all wells | | | | | Cum. | | Wildcat completions and discoveries | | | | | Cumulative total, 1956 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Comp. | Oil | Gas | Dry | Footage | 1956 | 1955 | Oil | Dist. | Gas | Dry | Total | Oil | Dist. | Gas | Dry | Total |
| Ala.-Ga.-Fla. | 5 | 1 | 0 | 4 | 21,963 | 15 | 16 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 9 | 9 |
| Arkansas | 11 | 6 | 0 | 5 | 37,402 | 83 | 50 | 2 | 0 | 0 | 2 | 4 | 5 | 0 | 1 | 14 | 20 |
| California | 44 | 34 | 0 | 10 | 210,476 | 237 | 221 | 1 | 0 | 0 | 8 | 9 | 6 | 0 | 0 | 37 | 43 |
| Colorado | 20 | 5 | 0 | 15 | 101,948 | 140 | 148 | 0 | 0 | 0 | 7 | 7 | 2 | 0 | 3 | 67 | 72 |
| Illinois | 71 | 36 | 0 | *35 | 174,453 | 500 | 473 | 0 | 0 | 0 | 4 | 4 | 7 | 0 | 0 | 65 | 72 |
| Indiana | 19 | 7 | 1 | 11 | 26,474 | 84 | 67 | 1 | 0 | 1 | 5 | 7 | 3 | 0 | 1 | 20 | 24 |
| Kansas | 108 | 54 | 10 | †44 | 387,462 | 520 | 575 | 1 | 0 | 2 | 14 | 17 | 8 | 1 | 5 | 97 | 111 |
| Kentucky | 39 | 16 | 6 | 17 | 67,705 | 227 | 152 | 1 | 0 | 0 | 9 | 10 | 6 | 0 | 0 | 54 | 60 |
| Louisiana | 63 | 41 | 3 | 19 | 486,244 | 506 | 438 | 4 | 2 | 1 | 7 | 14 | 10 | 12 | 3 | 67 | 92 |
| North | 19 | 15 | 1 | 3 | 67,537 | 202 | 238 | 1 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 21 | 24 |
| South | 38 | 23 | 1 | 14 | 375,621 | 249 | 200 | 3 | 2 | 0 | 7 | 12 | 7 | 11 | 1 | 42 | 61 |
| Offshore | 6 | 3 | 1 | 2 | 43,086 | 55 | | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 2 | 4 | 7 |
| Michigan | 8 | 5 | 0 | 3 | 25,952 | 62 | 78 | 1 | 0 | 0 | 2 | 3 | 2 | 0 | 0 | 16 | 18 |
| Mississippi | 4 | 1 | 0 | 3 | 19,422 | 57 | 45 | 0 | 0 | 0 | 1 | 1 | 4 | 0 | 0 | 22 | 26 |
| Montana | 4 | 3 | 0 | 1 | 19,268 | 49 | 46 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 13 | 14 |
| Nebraska | 15 | 5 | 0 | 10 | 78,760 | 101 | 69 | 1 | 0 | 0 | 9 | 10 | 3 | 0 | 0 | 48 | 51 |
| New Mexico | 27 | 14 | 5 | 8 | 124,874 | 244 | 127 | 0 | 0 | 1 | 4 | 5 | 6 | 0 | 4 | 24 | 34 |
| Northwest | 5 | 0 | 5 | 0 | 17,830 | 86 | 38 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 4 | 5 | 9 |
| Southeast | 22 | 14 | 0 | 8 | 107,044 | 158 | 89 | 0 | 0 | 0 | 4 | 4 | 6 | 0 | 0 | 19 | 25 |
| North Dakota | 3 | 2 | 0 | 1 | 25,152 | 25 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 6 |
| Ohio | 20 | 8 | 2 | †10 | 42,682 | 136 | 127 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| Oklahoma | 199 | 118 | 2 | ‡79 | 678,322 | 1,083 | 864 | 0 | 0 | 0 | 23 | 23 | 20 | 5 | 2 | 100 | 127 |
| Pennsylvania-New York | 5 | 0 | 3 | 2 | 19,291 | 75 | 207 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 1 | 2 | 3 |
| Texas | 485 | 331 | 13 | 141 | 2,195,467 | 2,479 | 2,147 | 26 | 1 | 4 | 94 | 125 | 115 | 7 | 23 | 568 | 713 |
| Southwest (1 & 4) | 55 | 32 | 3 | 20 | 222,707 | 359 | 333 | 3 | 0 | 1 | 14 | 18 | 21 | 2 | 6 | 115 | 144 |
| Gulf Coast (2 & 3) | 58 | 36 | 4 | †18 | 374,756 | 338 | 301 | 4 | 1 | 2 | 10 | 17 | 8 | 4 | 9 | 87 | 108 |
| East (5 & 6) | 29 | 10 | 2 | 17 | 137,483 | 136 | 142 | 0 | 0 | 0 | 12 | 12 | 1 | 1 | 1 | 56 | 59 |
| North Central (7-B & 9) | 147 | 87 | 1 | 59 | 516,906 | 869 | 670 | 10 | 0 | 0 | 35 | 45 | 58 | 0 | 1 | 206 | 265 |
| West (7-C & 8) | 171 | 149 | 0 | 22 | 846,682 | 635 | 573 | 8 | 0 | 0 | 22 | 30 | 24 | 0 | 4 | 96 | 124 |
| Panhandle (10) | 25 | 17 | 3 | 5 | 96,933 | 142 | 128 | 1 | 0 | 1 | 1 | 3 | 3 | 0 | 2 | 8 | 13 |
| Utah | 0 | 0 | 0 | 0 | 0 | 3 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| West Virginia | 33 | 1 | 28 | 4 | 79,061 | 82 | 79 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| Wyoming | 26 | 11 | 4 | 11 | 129,580 | 106 | 110 | 1 | 0 | 1 | 8 | 10 | 2 | 0 | 4 | 36 | 42 |
| Miscellaneous (Mo.) (Ida.) (Ore.) | 18 | 4 | 0 | 14 | 24,724 | 27 | 5 | 4 | 0 | 0 | 14 | 18 | 4 | 0 | 0 | 15 | 19 |
| Total United States | **1,227** | 703 | 77 | 447 | 4,976,682 | 6,841 | 6,073 | 43 | 3 | 10 | 219 | **275** | 204 | 25 | 47 | 1,285 | 1,561 |
| Total previous week | 1,054 | 544 | 83 | 427 | 4,118,176 | | | 32 | 0 | 5 | 193 | 230 | 161 | 22 | 37 | 1,066 | 1,286 |
| Cumulative 1956 | 6,841 | 3,692 | 467 | 2,682 | 28,025,181 | | | | | | | | | | | | |
| Total February 12, 1955 | 892 | 498 | 49 | 345 | 3,863,578 | | | 25 | 6 | 4 | 168 | 203 | 174 | 19 | 39 | 1,052 | 1,284 |
| Western Canada | 50 | 38 | 1 | 11 | 213,411 | 272 | | | | | | | | | | | |

Service wells included: *2, †1, ‡7.

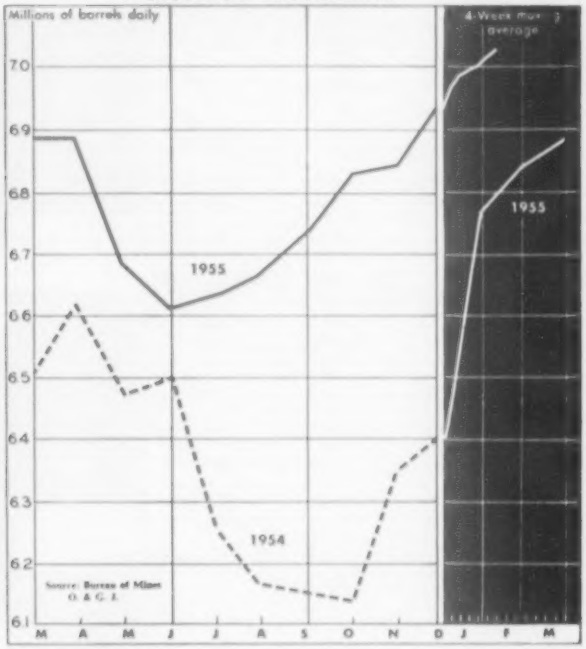
## CRUDE IMPORTS




## PRODUCT IMPORTS




## CRUDE-OIL PRODUCTION

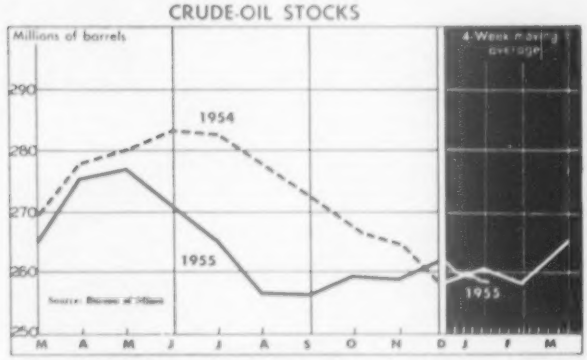



## DAILY AVERAGE PRODUCTION FOR WEEK

| | February 11 | | | Feb. 4 |
|---|---|---|---|---|
| | Crude oil | Lease condensate | Total | total |
| Alabama | 4,400 | | 4,400 | 4,200 |
| Arkansas | 72,100 | 500 | 72,600 | 73,150 |
| California | 980,200 | | 980,200 | 979,400 |
| Colorado | 160,200 | | 160,200 | 158,900 |
| Eastern | 49,300 | | 49,300 | 48,600 |
| Florida | 1,350 | | 1,350 | 1,350 |
| Illinois | 225,700 | | 225,700 | 228,500 |
| Indiana | 30,900 | | 30,900 | 31,000 |
| Kansas | 294,000 | | 294,000 | 347,800 |
| Kentucky | 45,000 | | 45,000 | 45,000 |
| Louisiana | 736,200 | 67,000 | 803,200 | 799,425 |
| North | 116,200 | 2,000 | 118,200 | 119,000 |
| South | 620,000 | 65,000 | 685,000 | 680,425 |
| Michigan | 30,200 | | 30,200 | 30,100 |
| Mississippi | 106,500 | 4,975 | 111,475 | 111,175 |
| Montana | 42,700 | | 42,700 | 41,900 |
| Nebraska | 28,400 | | 28,400 | 29,200 |
| New Mexico | 236,000 | 4,375 | 240,375 | 235,650 |
| North Dakota | 36,400 | | 36,400 | 40,700 |
| Oklahoma | 576,600 | | 576,600 | 601,500 |
| Texas | 2,978,300 | 54,100 | 3,032,400 | 2,979,100 |
| Dist. 1 | 53,000 | 600 | 53,600 | 50,750 |
| Dist. 2 | 151,000 | 8,375 | 159,375 | 160,525 |
| Dist. 3 | 441,000 | 25,300 | 466,300 | 458,875 |
| Dist. 4 | 246,000 | 5,350 | 251,350 | 249,075 |
| Dist. 5 | 46,500 | 525 | 47,025 | 46,725 |
| Dist. 6 | 130,000 | 6,275 | 136,275 | 134,850 |
| East Texas field | 223,800 | | 223,800 | 223,625 |
| Dist. 7-B | 156,000 | 50 | 156,050 | 152,625 |
| Dist. 7-C | 179,000 | 4,800 | 183,800 | 178,075 |
| Dist. 8 | 1,050,000 | 2,000 | 1,052,000 | 1,029,150 |
| Dist. 9 | 209,000 | 600 | 209,600 | 202,175 |
| Dist. 10 | 93,000 | 225 | 93,225 | 92,650 |
| Utah | 6,600 | | 6,600 | 5,600 |
| Wyoming | 288,300 | | 288,300 | 279,600 |
| Others | ‡300 | §10 | 310 | 210 |
| Total U. S. | 6,929,650 | 130,960 | **7,060,610** | 7,072,060 |
| Change from previous week, down | | | **11,450** | |
| Canada | †418,400 | | †418,400 | 429,350 |
| Total U. S. production January 1-February 11 | | | | 294,943,390 bbl. |
| Same period last year (crude plus cond.) | | | | *284,465,508 bbl. |

*Includes 4,808,700 bbl. condensate. †Week ended previous Monday. ‡Nevada. §Arizona.

## CRUDE-OIL STOCKS



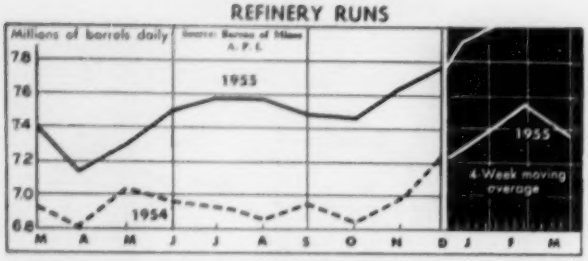

## CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

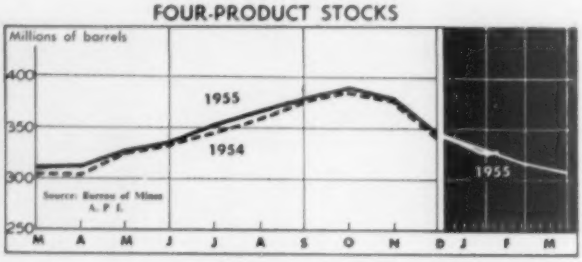
| | 2-4-56 | 1-28-56 | 2-5-55 |
|---|---|---|---|
| Pennsylvania Grade | 2,657 | 2,680 | 2,942 |
| Other Appalachian | 2,172 | 2,119 | 1,731 |
| Illinois, Indiana, Michigan | 9,362 | 9,112 | 11,105 |
| Nebraska, North Dakota | 2,280 | 2,213 | 2,123 |
| Kansas | 7,819 | 8,065 | 8,359 |
| Oklahoma | 21,599 | 22,060 | 24,011 |
| Arkansas | 2,177 | 2,125 | 3,071 |
| Louisiana | 16,370 | 16,066 | 14,941 |
| North | 2,662 | 2,658 | 2,463 |
| South | 13,708 | 13,408 | 12,478 |
| Mississippi | 3,047 | 2,978 | 3,205 |
| New Mexico | 7,774 | 7,730 | 7,980 |
| Texas | 123,490 | 123,369 | 118,029 |
| East Texas proper | 9,145 | 8,753 | 9,941 |
| West Texas | 58,890 | 58,946 | 51,302 |
| Texas Gulf | 24,514 | 24,616 | 23,793 |
| Other Texas | 30,941 | 31,054 | 32,993 |
| Wyoming | 15,590 | 15,616 | 14,641 |
| Other Rocky Mountain | 5,670 | 5,638 | 5,659 |
| California | 27,763 | 27,483 | 31,414 |
| Foreign | †10,440 | 11,152 | 10,933 |
| Total | 258,210 | 258,406 | 260,144 |

*Bureau of Mines. †Includes 1,797,000 bbl. in California.

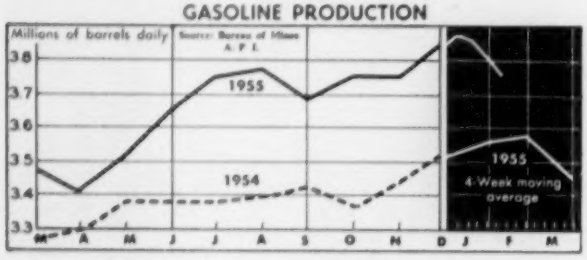
REFINERY RUNS



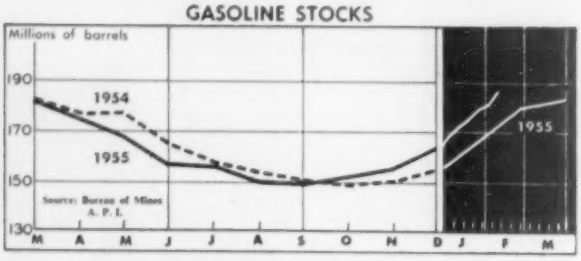

FOUR-PRODUCT STOCKS



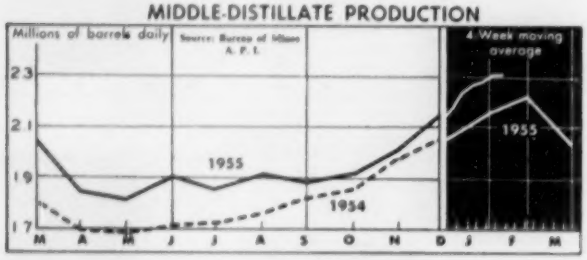

GASOLINE PRODUCTION



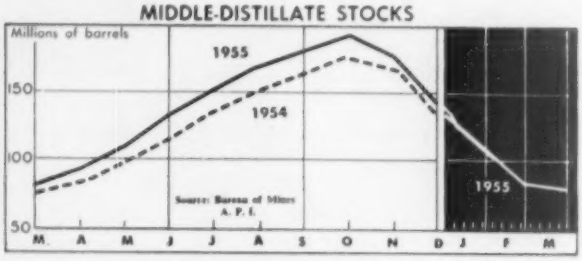

GASOLINE STOCKS



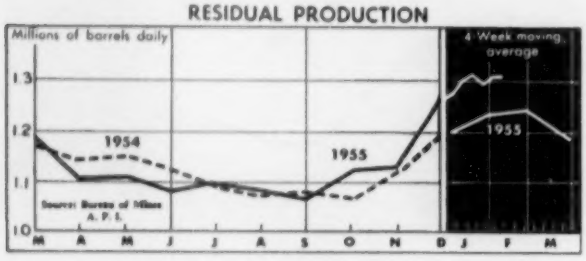

MIDDLE-DISTILLATE PRODUCTION



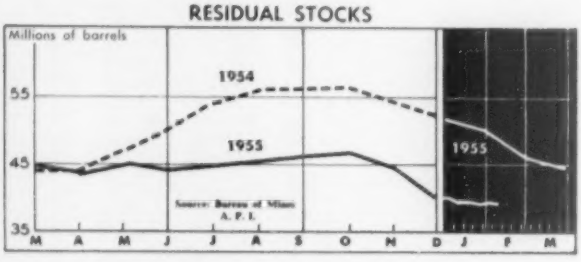

MIDDLE-DISTILLATE STOCKS




RESIDUAL PRODUCTION




RESIDUAL STOCKS




## A.P.I. GRAVITY REPORT, FEBRUARY 10

(Thousands of barrels)

| District— | Daily avg. runs | Daily average production Gaso.* | Kero. | Dist. | Resid. | Stocks‡ Gaso.† | Kero. | Dist. | Resid. | Bureau of Mines, February 1955 Daily avg. runs | Daily average production Gaso.* | Kero. | Dist. | Resid. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Coast | 1,087 | 453.3 | 34.9 | 280.6 | 273.1 | 36,335 | 8,844 | 28,314 | 10,793 | 1,102 | 437.2 | 40.4 | 306.4 | 244.5 |
| Appalachian: | | | | | | | | | | | | | | |
| District 1 | 99 | 39.0 | 7.0 | 25.1 | 11.0 | 4,742 | 521 | 1,510 | 412 | 98 | 41.2 | 5.2 | 25.2 | 9.1 |
| District 2 | 108 | 48.9 | 7.0 | 19.3 | 17.7 | 2,812 | 306 | 540 | 276 | 91 | 47.7 | 6.6 | 19.3 | 15.1 |
| Ind., Ill., Ky. | 1,533 | 772.2 | 80.1 | 323.4 | 221.9 | 39,008 | 4,513 | 13,327 | 3,863 | 1,394 | 707.5 | 80.1 | 312.6 | 190.2 |
| Okla., Kans., Mo. | 747 | 411.2 | 19.6 | 207.7 | 38.4 | 21,767 | 824 | 8,457 | 898 | 670 | 380.0 | 19.0 | 171.5 | 45.4 |
| Inland Texas | 270 | 186.0 | 7.7 | 50.1 | 27.6 | 7,412 | 315 | 1,500 | 1,290 | 258 | 182.6 | 11.4 | 52.6 | 18.2 |
| Texas Gulf Coast | 2,008 | 850.4 | 138.6 | 552.6 | 238.6 | 28,149 | 2,159 | 8,581 | 6,328 | 1,894 | 843.4 | 130.6 | 525.8 | 243.5 |
| La. Gulf Coast | 708 | 299.9 | 63.1 | 187.3 | 71.1 | 10,371 | 1,598 | 4,296 | 1,533 | 645 | 305.3 | 60.5 | 165.7 | 39.8 |
| N. La. and Ark. | 96 | 36.1 | 8.6 | 24.6 | 7.0 | 4,696 | 492 | 1,474 | 65 | 94 | 33.9 | 10.7 | 21.9 | 6.7 |
| Rocky Mountain: | | | | | | | | | | | | | | |
| New Mexico | 20 | 9.7 | ..... | 3.7 | 2.4 | 292 | 9 | 61 | 32 | 20 | 11.4 | 0.5 | 3.0 | 2.7 |
| Other Rocky Mtn. | 266 | 116.0 | 4.0 | 63.9 | 42.1 | 7,275 | 235 | 2,325 | 774 | 256 | 119.9 | 4.6 | 62.9 | 40.0 |
| California | 1,074 | 477.2 | ..... | 181.3 | 359.2 | 24,759 | 253 | 10,184 | 11,463 | 1,027 | 456.9 | 4.4 | 180.2 | 383.5 |
| Feb. 10, 1956 | 8,016 | 3,699.9 | 370.6 | 1,919.6 | 1,310.1 | 187,618 | 20,069 | 80,569 | 37,727 | 7,549 | 3,567.0 | 374.0 | 1,847.1 | 1,238.7 |
| Feb. 3, 1956 | 8,068 | 3,734.1 | 402.0 | 1,933.6 | 1,334.4 | 182,656 | 20,357 | 84,230 | 38,570 | ..... | ..... | ..... | ..... | ..... |
| Feb. 11, 1955 | 7,384 | 3,601.1 | 372.6 | 1,794.4 | 1,237.6 | 174,203 | 21,438 | 76,158 | 46,689 | ..... | ..... | ..... | ..... | ..... |

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

# Crude-oil and refinery prices at representative U. S. and foreign points

## REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

### GASOLINE*

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| Regular (86 octane) | 11.00-11.25 |
| Premium (94 octane) | 12.50-12.75 |
| **Gulf Coast (Cargoes for coastwise or export movement):** | |
| Regular (90 octane) | 11.00-11.25 |
| Premium (97 octane) | 13.00-13.25 |
| **New York (barges):** | |
| Regular (89 octane) | 12.25 |
| Premium (96 octane) | 14.50 |
| **California—Los Angeles (rack):** | |
| Regular (84 octane) | 13.10-13.15 |
| Premium (93 octane) | 14.10-15.10 |
| **Caribbean area (cargoes):** | |
| Regular (87 octane) | 10.50 |
| Premium (93 octane) | 11.50 |

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

### NATURAL GASOLINE*

| | |
|---|---|
| **Group 3:** | |
| Grade 26-70 | 5.5 |
| **Breckenridge:** | |
| Grade 26-70 | 5.0 |

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

### KEROSINE AND DISTILLATE

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| Kerosine 42-44 | 10.25-10.375 |
| Diesel oil (58 d.i. and above) | 9.875-10.00 |
| Distillate No. 1 | 9.875-10.00 |
| Distillate No. 2 | 9.25-9.375 |
| **Gulf Coast (cargoes):** | |
| Kerosine 41-43 | 9.5-9.625 |
| Distillate No. 2 | 9.00-9.25 |
| **New York Harbor (barges):** | |
| Kerosine 41-43 | 10.85 |
| Distillate No. 2 | 10.35 |
| Diesel fuel, 48-52 d.i. | 10.65 |
| **Caribbean area (cargoes):** | |
| Distillate No. 2 | 9.00 |

### WAX (LB.)

| | |
|---|---|
| **Oklahoma (Group 3):** | |
| 132-135 A.m.p. (semi-refined) in tank cars | 6.50 |
| **New York (export):** | |
| 126-130 A.m.p. crude scale (solid in bags or barrels) | 7.10 |

★ Denotes change from previous week.

### RESIDUAL FUEL (BBL.)

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| Residual fuel (max. 1% S) | $2.10-2.20 |
| **Gulf Coast (cargoes):** | |
| Bunker C fuel | $2.10 |
| **New York Harbor (barges):** | |
| Bunker C fuel | $2.65 |
| **Caribbean (cargoes):** | |
| Bunker C at Aruba, N.W.I. | $2.10 |
| **California (rack):** | |
| ★ Bunker C fuel, Los Angeles | $2.15-2.20 |

### LUBRICATING OILS

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| 150-160 bright stock, solvent refined 0-10 p.p., 95 v.i. | 23 |
| 200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i. | 19.75 |
| **Pennsylvania Grade:** | |
| 145-155 vis. at 210, bright stock, 8 color, 25 p.t. | 23.5 |
| 200 vis. neutral (180 at 100°), 25 p.t. | 20 |

## CRUDE-OIL PRICES

### GRAVITY SCHEDULE

| | ★ Signal Hill, Calif. | Mid-Cont.* | Gulf Coast Tex.† | West Tex.‡ N.M. | Wyo. (sour) |
|---|---|---|---|---|---|
| 14-14.9 | $2.02 | | | | |
| 15-15.9 | 2.08 | | | | |
| 16-16.9 | 2.13 | | | | |
| 17-17.9 | 2.19 | | | | |
| 18-18.9 | 2.24 | | | | |
| 19-19.9 | 2.30 | | | | |
| 20-20.9 | 2.35 | $2.50 | | $2.37 | |
| 21-21.9 | 2.41 | 2.52 | | 2.39 | |
| 22-22.9 | 2.47 | 2.54 | | 2.41 | |
| 23-23.9 | 2.52 | 2.56 | | 2.43 | |
| 24-24.9 | 2.58 | 2.58 | $2.91 | 2.45 | |
| 25-25.9 | 2.64 | 2.60 | 2.93 | 2.47 | |
| 26-26.9 | 2.69 | 2.62 | 2.95 | 2.49 | |
| 27-27.9 | 2.76 | 2.64 | 2.97 | 2.51 | |
| 28-28.9 | 2.83 | 2.66 | 2.99 | 2.53 | |
| 29-29.9 | 2.91 | 2.68 | 3.01 | 2.55 | |
| 30-30.9 | 2.97 | 2.70 | 3.03 | 2.57 | |
| 31-31.9 | 3.04 | 2.72 | 3.05 | 2.59 | $2.46 |
| 32-32.9 | 3.12 | 2.74 | 3.07 | 2.61 | 2.48 |
| 33-33.9 | 3.20 | 2.76 | 3.09 | 2.63 | 2.50 |
| 34-34.9 | 3.27 | 2.78 | 3.11 | 2.65 | 2.52 |
| 35-35.9 | 3.34 | 2.80 | 3.13 | 2.67 | 2.54 |
| 36-36.9 | 3.39 | 2.82 | 3.15 | 2.69 | 2.56 |
| 37-37.9 | | 2.84 | 3.17 | 2.71 | 2.58 |
| 38-38.9 | | 2.86 | 3.19 | 2.73 | 2.60 |
| 39-39.9 | | 2.88 | 3.21 | 2.75 | 2.62 |
| 40 and up | | 2.90 | 3.23 | 2.77 | 2.64 |

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas, and Wyoming (sweet). †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, February 6, 1956.

### FLAT PRICES

| | |
|---|---|
| **Louisiana:** | |
| Cotton Valley (distillate) | $3.00 |
| Cotton Valley (Holloway crude) | 2.95 |
| **Texas:** | |
| East Texas | 2.90 |
| Chapel Hill | 2.83 |
| Conroe | 3.13 |
| Van | 2.73 |
| **Pennsylvania Grade:** | |
| Bradford | 4.00 |
| Middle District | 3.87 |
| Southwest Pennsylvania | 3.58 |
| West Virginia | 3.46 |
| Buckeye Grade | 3.40 |
| Zanesville Grade | 2.97 |
| **Illinois Basin** | 3.00 |
| **Canada:** | |
| Leduc-Woodbend (flat prices D-2, D-3) | 2.60 |
| Redwater (Alta.) D-3 | 2.49 |
| Smiley-Viking (Sask.) | 2.26 |
| Fosterton (Sask.) | 1.29 |
| Pembina | 2.52 |

### FOREIGN

| | |
|---|---|
| **Venezuela:** | |
| Cumarebo, 48°-48.9°, Tucupido | *$3.40 |
| San Joaquin, 41°-41.9°, Puerto La Cruz | *3.04 |
| Oficina, 35°-35.9°, Puerto La Cruz | *2.80 |
| Tia Juana medium, 26.5°-26.9°, Amuay | †2.30 |
| Quiriquire, 16.5°-16.9°, Caripito | ‡2.21 |
| Lagunillas heavy, flat, Amuay or Las Piedras§ | 2.05 |
| Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§ | ‡1.90 |

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

| | |
|---|---|
| **Middle East, Persian Gulf (cargoes, f.o.b. lifting port):** | |
| Arabian, 36.0°-36.9°, Ras Tanura | $1.97 |
| Iranian, 34.0°-34.9°, Bandar Mashur | 1.91 |
| Iranian, 34.0°-34.9°, Abadan | 1.86 |
| ★ Iraq, 36.0°-36.9°, Fao | 1.87 |
| Kuwait, 31.0°-31.9°, Mina-al-Ahmadi | 1.72 |
| Qatar, 39.0°-39.9°, Umm Said | 2.06 |
| **Middle East, E. Mediterranean:** | |
| ★ Arabian, 36.0°-36.9°, Sidon | 2.46 |
| ★ Iraq, 36.0°-36.9°, Tripoli, Banias | 2.46-2.49 |
| **Far East (cargoes, f.o.b. Lutong, Sarawak):** | |
| Seria Light, 37°-38° | 2.66 |

### TANKER RATES (PER LONG TON)

(Latest reported spot fixtures)

| | |
|---|---|
| Gulf-U.S.N.H., clean (USMC 25%) | $3.56 |
| Gulf-U.S.N.H., dirty (USMC 45%) | 4.13 |
| NWI-U.S.N.H., dirty (USMC flat) | 2.70 |
| NWI-U.K., dirty (MOT flat) (32s. 6d) | 4.56 |
| Persian Gulf-U.K., dirty (Scale 40%) (67s. 0d.) | 9.40 |

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**HOT OIL PUMPS**
Worth. 12" KUF Diesel drive.
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**TRANSFER PUMPS**
Duplex from 4x3x4 to 10x7x12.

**FURNACE TUBES**
4-6% Chrome ⅛ New Cost

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4'x59' 160 PSI 23 trays.
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3'x49' 425 PSI 28 trays.
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1406 SCFM Gas Driven 250 PSI.

**ETHYL BLENDING PLANT**
4200 gal. Tank, Scale & Building.

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3¼" O.D.
3½" O.D.
4" O.D.
5⅝" O.D.
5½" O.D.

Approximately 5 miles of each diameter available in single or double random lengths with beveled ends.

**Write—Wire—Phone**

**Sonken-Galamba Corporation**
**2nd and Riverview (X-982)**
**Kansas City 18, Kansas**
**ATwater 1-9305**

## FOR SALE EQUIPMENT

FOR SALE: 86' Oilwell Mast, with 4½ Substructure. Telephone: CE 2-6318, Oklahoma City, Okla.

## Service Company

HAVE BEST well servicing outfit in Osage. All new equipment. 2 Spudders and 4 double drum Franks units. Will net $5,000.00 per month. Have own yard and office. $135,000 cash for quick sale.

**Box J-376, The Oil and Gas Journal, Tulsa, Oklahoma.**

## LIQUIDATING

**Former**

**PURE OIL COMPANY REFINERY**
**Charleston, West Virginia**

•

**BAY OIL REFINERY**
**McPherson, Kansas**

3,000 bbl. Thermal Cracking Unit
6,000 bbl. Topping Plant
Complete Rerun Unit
Two POLY PLANTS
Lube Oil & Paraffin Wax Plant
Six B&W H.R.T. Boilers, 250 H.P.
Two B&W Sterling Type 275 H.P. Boilers
Over 100 HEAT EXCHANGERS from 80 to 1,500 sq. ft.
COOLERS and CONDENSERS all sizes to 850 sq. ft.
HOT OIL CHARGE PUMPS steam and gas engine driven.
Storage Tanks, suitable for Bulk Plants
LARGE TANK FARM, riveted tanks from 1,000 to 55,000 bbl. capacity
Complete ETHYL Blending Unit, 8500 gal. cap.
LABORATORY—INSTRUMENTS—TRANSFORMERS—over 200 for every type service, electric motor, gear and steam driven.

**Many other items too numerous to list. . . . Substantial Savings.**

**Write For Detailed Catalogue**

**Brown-Strauss Corporation**

**1346 Guinotte Ave. Kansas City, Mo.**
**Phone HArrison 1-1000**

**FIELD OFFICE:**
**Cabin Creek (suburb of Charleston), W. Va.**
**Phone: East Bank 5611.**
**Mail Address P. O. Box 2921**
**Charleston, W. Virginia**
**ROY CRISP, Mgr.**

***Stop Tong Breakage!***

**ARMITE DRILL COLLAR & TOOL JOINT COMPOUND**

**ARMITE LABS., 8909 Broad St., Los Angeles 1, Calif.**
**Petro. Industries Consultants, C.A. Caracas, Venez.**

FOR SALE—At Bargain—Welded Oil Storage Tanks. 1 ea. 55,000 bbl., 96'9" diameter, 1 ea. 20,000 bbl., 63'1" diameter. Excellent Condition. Write, Wire or Call for Complete Information & Prices. Southwestern Supply & Equipment Co., P. O. Box 14357, Houston, Texas.

## NEED A PIPE LINE

Have 800 Miles 8" Line Pipe we are taking up through Illinois, Indiana, and Ohio. Will furnish pipe, go in on a deal, or finance.

We are open for any kind of deal.

**REDNEB PIPE CO.**

P. O. Box 1798 Shreveport, La.
Phone 4-7767—68

## FOR SALE

**RECONDITIONED SEAMLESS STEEL TUBING—TESTED 1000# PSI**

| QUANTITY | SIZE | PIPE SUBSTITUTE |
|---|---|---|
| 100,000' | 2" OD | 1½" STD. |
| 100,000' | 2¼" OD | 2" STD. |
| 20,000' | 3½" OD | 3" STD. |
| 20,000' | 4" OD | 3" or 4" STD. |
| 25,000' | 5⅝" OD | 4" or 6" STD. |
| 25,000' | 5½" OD | 4" or 6" STD. |

**DOUBLE RANDOM LENGTHS—BEVELED FOR WELDING**

Excellent for gas, water, air or irrigation and flow lines. Immediate delivery. Delivered free in truckload lots. Prices upon request.

**ALSO OTHER SIZES**
**PIPE—CASING—TUBING**
½" to 30" OD

WRITE WIRE PHONE

**VALLEY STEEL PRODUCTS CO.**
ST. LOUIS 4, MISSOURI
PRospect 2-2100



MAYHEW "HURRICANE" Rotary Air Drill on F-8 Ford truck, two years old, excellent condition. Faylor Lime & Stone Co., Winfield (Union Co.), Pa.

MONROE ODOGRAPH, dead-reckoning mapping instrument for Jeep installation. $5000 new, used 6 weeks. Perfect. Make offer. John McKee, Rte. 2, Box 64 A, Forest Grove, Oregon.

CONTINENTAL 66 and 96, Fairbanks Morse 346 and 503, Buda K 428 gas engines. UD 6 40 HP International Diesel engine. All completely reshopped. Nolan Sales Corporation, 421 N. Cincinnati, Tulsa, Okla.

FOR SALE—At our Oklahoma City warehouse one used 2½"-5" x 10" Gaso power pump, Fig. 710-S Serial No. 7435 on steel base and V-belted to HXE Hercules motor, serial No. 3330493. Price $1250.00. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

FOR SALE—Pipe Line Pump—New Condition. 500 GPM @ 492' Head or 850 bbls. per hour @ 450' Head. Mfg. by Carver & Driver by a Continental T-427 Engine. $2,650.00 f.o.b. Houston. Southwestern Supply & Equipment Co., P. O. Box 14357, Houston, Texas.

## SPECIAL OFFERING

125,000 feet, 12¾" OD 51.15# L.W. R-1 T and C or P.E. located in the Baton Rouge, Louisiana area. This pipe can be used for surface pipe or Line Pipe.

WRITE, WIRE, OR 'PHONE.
SUBJECT TO PRIOR SALE

**Sabine Pipe & Supply Company**
P. O. BOX 111.
PHONES 3094—3095
KILGORE, TEXAS.

## SPECIAL PIPE SALE

**88,000 ft. 8⅝" O.D. x 28.55 lb./ft.**
**16,000 ft. 12¾" O.D. x 49.56 lb./ft.**
Reconditioned Machine Cleaned Straight, Beveled for Welding in 20 Foot Random Lengths.

—SPECIAL DEALER PRICES

Write—Wire—Phone

**Sonken-Galamba Corporation**
2nd and Riverview (X-263)
Kansas City 18, Kansas
ATwater 1-9305

## FOR SALE

**Equipment Formerly Used In**

**MAGNOLIA REFINERY—**

**FORT WORTH, TEXAS**

**Phones 5-2581 Beaumont, Texas.**

**259 Burleson, Texas.**

**Valley—7166 Fort Worth, Texas**



## ANOTHER BRILL LIQUIDATION!

**FORMER LACY REFINERY**
**BIG SANDY, TEXAS**

**COMPLETE POLY UNIT, BUILT 1950**
**UOP RATED 144 BBL. DAY**

Complete Perco unit built 1950, Phillips Petroleum rated 1400 bbl./day.
1—Wyatt 30" x 70' Stabilizer 160# 30 tray
3—Absorbers, 14" x 40', 20" x 50', 160#
2—Wash Towers, 18" x 23', 150#
1—Reactor, 24" x 28', 550#
1—Depropanizer, 20" x 35', 450#
1—Debutanizer, 12" x 26', 120#
3—Brinkman vertical tube furnaces 2, 1¼ mil. BTU/hr.
20—Brown fintube exchangers, 600# 140 sq. ft. 4-6 chrome.
20—Brown fintube exchangers, 600# 11, 21, 77, 101, 140 sq. ft.
5—Adm. Heat Exchangers, 644, 424, 346, 176 sq. ft.
2—Perco reactors 4500 gal., 8' x 12', 347 stls. st. 120#, 1000° F.
1—5' x 96' tower, 40 tray, 135# WP.
1—7' x 30' Propane tank, 250# WP.
1—10' x 50' Crude tower, 18 trays.
1—6' x 34' Vacuum tower, 150#.
1—2' x 50' tower, 24 trays.
3—Welded tanks, 10' x 40', 10' x 30', 5' x 20'.
3—St. Exchs., 920, 850, 480 sq. ft.
9—Oilfield boilers, 125 hp., 275#.
1—Ethyl lead plant.
3—Penn. comp. 8 x 11 x 9, 12 x 11½ x 13, 10 x 6 x 11.
2—Convection furnaces, 20 MIL BTU/hr.
1—Vapor phase cracking furnace.
30—Welded storage tanks, 5000, 2000, 1000, 500 Bbl.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.
30—Duplex piston pumps, all sizes.
1—10' x 30' asphalt still.
6—Steel Bldgs., 20 x 150, 12 x 20, 20 x 40, 20 x 20.
8—GR Fin Tube Exchangers, 248 sq. ft. 500 lb.
1—BS&B Oil & gas separator, 10.7 mcf, 3500 Bbl./day.
Large Selection of Series 15, 30 Steel Valves, 1" to 8".
Approximately 15,000 ft. Schedule 40, 80 pipe, 2" to 8".

**COMPRESSOR STATION—BALT., MD.**

3—600 hp IR KVG Gas Comp.

**EQUIPMENT ELSEWHERE**

**COLUMNS**

7'6" x 55' 30 trays 45 lb.
8' x 75' 25 tray 40#
2' x 60' 35 tray 560#

**HEAT EXCHANGERS**

6—Adm. 785, 742, 425 sq. ft.
3—St. 2000, 785 sq. ft.
30—Atmospheric Bentube exch., stls and Adm. 715, 470 sq. ft.
30—304 SS shell & tube condensers 100-1000 sq. ft.

**MISCELLANEOUS**

Lab Petro-chem furnace 50,000 BTU/hr.
Gould 4" Pump 400 gpm 1600' hd.
B-J hot oil pump 3 x 9, 13 st, 325 gpm, 4620' hd.
Gould 16" pump 10,500 gpm, 135' hd.
800 ft. of 2" 4-6 ch pipe.
Large quantity of 410 SS chrome strips and sheets.
2 Worth. Centrifugal Pumps, 1500 gpm 50' hd.
1 BJ 8" Centrifugal Pump, 2000 gpm 115' hd.
1 BJ 2" Centrifugal Pump, 280 gpm 200' hd.
Tremendous selection stainless steel and steel valves ½" - 6".

*Partial List Only*

WIRE PHONE WRITE

**For Detailed Circular**

**BRILL EQUIPMENT COMPANY**
4101 San Jacinto St., Houston 4, Texas, JA 6-1351
Or
2401 Third Ave., New York 51, N. Y., CYpress 2-5703

## FOR SALE EQUIPMENT

FOR SALE: Used R. L. Cardwell Drilling-in Unit. Splendid condition with all accessories and large Doghouse. Located near Wichita. Phone or write John Richard, McClelland Hotel, Wichita, Kansas; or write Box 361, Topeka, Kansas.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

FOR SALE—Bucyrus-Erie 36 L, completely equipped, excellent condition. 15½ to 5 inch tools. $14,000.00. RR #2, Box 253, Caney, Kansas. Phone 422.

FOR SALE: Wilson-Snyder mud pump, 7¼" x 18". Top condition and less than half price. L. T. Peyton Machine Shop, Vernal, Utah. Phone 267.

FOR SALE: National T-12 rig on 32' Tandem Trailer, 145 HP Motor, water cooled brakes, complete except drill pipe. First class condition. Can be used for drilling or workover. Box 91, South Houston, Texas.

FOR SALE—We are shutting down our chemical plant at Tallant, Oklahoma. Material inventory available for mailing. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

COUPLINGS: 13⅜" x 8 Rd. x 8" Long, seamless, for sale. New, clean, never in use. Quantity—attractive price. Box J-348, The Oil and Gas Journal, Tulsa, Oklahoma.

GAS COMPRESSORS: New or Used, for Sale or Lease, Horse Power Range 50 to 800. Alfred B. Kern Company, 343 Kennedy Bldg., Tulsa, Oklahoma.

3500' ROTARY Wilson Super draw-works. 145 H.P. Waukesha engine, 87' pole mast stands double 7¼ x 10 mud pump powered with Waukesha, 3000' of 3½" drill pipe, complete every way. New in 1954. Sacrifice $27,000.00. Call Hughes, Riverside 2-8147 Nights, Tulsa.

SMALL LIQUID Extraction and gasoline plant for sale or lease. Box J-389, The Oil and Gas Journal, Tulsa, Okla.

FOR SALE—At our Oklahoma City warehouse one used 2½"-5" x 19" Fig. 1450 Wheatley power pump, Ser. WBM 2060, mounted on steel base and DC to Buda BTH motor, Ser. No. 226569A with extra set of 3" and 3½" liners. Price $1250.00. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

FOR SALE: Mayhew 2000 drill unit mounted on a tandem Diamond T truck complete and ready to go to work. This is an exceptional rig and fully equipped. For further information contact, P. O. Box 547, Eldorado, Kansas, or call 392 collect.

## EQUIPMENT WANTED

1 USED T-12 Draw Works—Single Drum. Joe S. Jackson, Box 1738, Wichita Falls, Texas.

WANTED: One tower approximately 7 feet diameter, 100 feet high, ¾" minimum wall, with 50 trays, to be used for isobutane splitter. Apply Box J-392, The Oil and Gas Journal, Tulsa, Oklahoma.

## HELP WANTED

LEADING Independent oil company needs graduate petroleum engineer with three to four years' experience in completions, workovers, testing, and waterflooding. Work to be in West Texas. Salary open. Replies confidential. Box J-347, The Oil and Gas Journal, Tulsa, Oklahoma.

## HELP WANTED

# PROJECT ENGINEER

National Engineering and Construction Company seeks an experienced Project Engineer with several years of refinery plant engineering background for work in the Midwest.

This man must be capable of taking complete charge of a job, supervise layouts and design, select plant equipment, and maintain amiable customer relations.

In applying furnish a detailed resume of your education, experience, references and a recent snapshot. Salary open.

**Box J-387, The Oil and Gas Journal**
**P. O. Box 1260 Tulsa, Oklahoma**

## GEOLOGICAL PARTY CHIEF

Major American oil company has immediate opening for an experienced Party Chief with assignment in Turkey. Attractive salary, pension plan, and expenses provided.

Write giving age, marital status, education and complete details of experience.

**BOX 308-G**
**RADIO CITY STATION**
**NEW YORK 19, N. Y.**

## *Plant Equipment Inspectors*

Graduate engineers with minimum 5 years' experience in design or inspection of petroleum processing plants and equipment. Major part of experience must have been in inspection work entailing general knowledge of all facilities. Develop inspection methods, supervise and conduct inspections and advise operations on codes and equipment limitations in a major oil installation located in Saudi Arabia.

Write giving full particulars regarding personal history and work experience. Please include your telephone number.

***Recruiting Supervisor, Box 90***
**ARABIAN AMERICAN OIL COMPANY**
**505 PARK AVENUE**
**NEW YORK 22, NEW YORK**

PETROLEUM ENGINEER under 35, drilling and production work, San Juan Basin, New Mexico, with compact but enterprising operator. Salary dependent upon qualifications and experience. Send detailed experience record. Box J-364, The Oil and Gas Journal, Tulsa, Oklahoma.

## Petroleum Engineer

With B.S. degree and one to two years experience in production. Age 25 to 35 with preferable experience in Gulf Coast area. outline education and experience.

**Box J-381, The Oil and Gas Journal, Tulsa, Oklahoma.**

## ADMINISTRATIVE ASSISTANT

Independent oil company has opening March 1 for young administrative assistant who has an oil background either in drilling or production. Will work as assistant to General Manager. Must be capable of handling administrative details; preferably Business Administration graduate. Good personality essential, age limit under 35. In replying, give past employment record and educational background. All replies handled strictly confidential. Reply

**Box J-395,**
**The Oil and Gas Journal,**
**Tulsa, Oklahoma.**

**Unusual opportunity with substantial salary for qualified**

## DEVELOPMENT AND DESIGN ENGINEER

This position offers a secure future and excellent possibilities for advancement with a major oil equipment manufacturing concern. Please give complete personal history and experience. Salary open. All inquiries will be acknowledged and held in confidence.

Interviews will be arranged in Houston. Write

**Box J-359, The Oil and Gas Journal,**
**Tulsa, Oklahoma.**

## OIL FIELD SERVICE ENGINEERS

Mechanical or Petroleum Engineers with some field experience. Men without degrees but with two years rotary or workover rig experience may qualify. High school diploma or equivalent required. Age under 35 preferred. Good pay with excellent fringe benefits. Automobile and expenses.

**Contact**
**BAKER OIL TOOLS, INC.**
**P. O. Box 3048**
**HOUSTON 1, TEXAS**

**HELP WANTED**

WATER FLOOD ENGINEER—Consulting firm needs an engineer experienced in planning, installation and operation of water floods. Initial application should list past experience and educational background in detail. Salary requirement should be included. Box J-361, The Oil and Gas Journal, Tulsa, Oklahoma.

**PIPE LINE ENGINEER**

Graduate engineer with 4 - 7 years pipe line experience for engineering department of major crude and products pipe line company. Location in Texas. Salary according to qualifications. Give full details of experience.

**Box J-386, The Oil and Gas Journal, Tulsa, Oklahoma.**

**HELP WANTED**

MECHANICAL ENGINEERS—M.E. Degree required for work involving Research, Design, and/or Development of oilfield specialties. Apply Personnel Department, Mission Manufacturing Co. P. O. Box 4209, Houston, Texas.

GAS ACCOUNTANT with several years experience in general and gas accounting and some experience in supervising personnel—about 35 years age. Box J-391, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Petroleum Engineers to fill vacancies created by expansion wanted by medium sized oil company operating in all areas east of California. Applicants should have minimum of 3 years field experience. Replies confidential. Please furnish detailed summary of academic and experience background. Box J-377, The Oil and Gas Journal, Tulsa, Oklahoma.

**HELP WANTED**

**FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.**

JUNIOR ENGINEER WANTED—Excellent opportunity for young engineer interested in employment with well-known aggressive oil company in its Production Department. Experience is not required, but applicant should have a college degree, preferably in Petroleum or Mechanical Engineering. Initial location would be in the General Office at Oklahoma City. Write giving age, education, and salary expected. Please address Anderson-Prichard Oil Corporation, Liberty National Bank Building, Oklahoma City 2, Oklahoma, for the attention of Mr. D. F. Tver, Industrial Relations Department.

## CHEMICAL ENGINEERS

For responsible staff positions in New York Office directing the work of groups of experienced engineers doing process evaluation and design, economic studies and related work on refining and crude oil handling facilities, together with supporting power plants and other utilities. Work entails occasional trips of short duration to Europe and Middle East. Chemical Engineering degree plus 5 years' process experience, preferably in petroleum.

Salary commensurate with training and work experience. Liberal benefit program. Write giving full particulars regarding personal history and work experience. Please include telephone number.

***Recruiting Supervisor, Box 100***

**ARABIAN AMERICAN OIL COMPANY**

**505 Park Ave., New York 22, N. Y.**

## PROCESS SUPERVISOR NEW REFINERY at PONCE, PUERTO RICO

Immediate position open for experienced operator with technical background having several years of full responsibility directing operations of comparable modern integrated refinery, which includes Catalytic Cracking and Reforming, Polymerization, Alkylation and Acid Regeneration. This represents excellent opportunity for properly qualified man.

Reply Air Mail giving complete resume, including present salary, availability, etc.

**COMMONWEALTH OIL REFINING CO., INC.**

**TEN POST OFFICE SQUARE BOSTON 9, MASS.**

## PROCESS ENGINEERS

CAREER OPPORTUNITIES IN

**SOUTHERN CALIFORNIA**

•

for men with a minimum of five years' experience in PROCESS DESIGN for Petroleum or Chemical Plants.

•

**OFFERING MAXIMUM OPPORTUNITIES FOR:**

Utilization & recognition of individual initiative & ability.

Broad responsibilities rather than narrow specialization.

Experience with a wide range of processes.

•

**LIBERAL SALARY RANGES, PROFIT SHARING, TOP BENEFITS, & IDEAL WORKING CONDITIONS**

*Submit resume of training & experience to:*

**The FLUOR CORP.**

ENGINEERS—CONSTRUCTORS

2500 S. Atlantic Blvd.

Los Angeles 22, Calif.

## GULF RESEARCH & DEVELOPMENT COMPANY

### Has positions now open for

- **ELECTRICAL ENGINEERS & PHYSICISTS—B.S., M.S.**

Design and development of electronic equipment and instruments for recording and remote reading of deep well pressures, temperature, flow; production, pipeline and off-shore instrumentation, control and automation.

- **MECHANICAL ENGINEERS—B.S., M.S., Ph.D.**

Design and development of mechanical or hydraulic equipment and techniques for drilling and completion of wells; fracturing of earth formations; flow and treatment of well and pipeline fluids.

- **PETROLEUM ENGINEERS—M.S., Ph.D.**

Development of techniques and equipment for drilling and completion of wells; improvement of productivity into boreholes; production methods; fracturing of formations; consolidation of sands; development of thermal recovery techniques, reservoir behavior analysis, uses of pressure and temperature transients.

- **CHEMICAL ENGINEERING—B.S., M.S., Ph.D.**

Development of physical properties, chemical formulations, techniques of treatment and design of experimental equipment for investigation of colloidal fluids used in well drilling; chemical treatment of produced fluids; and other applications of chemical engineering to oil field production problems. Investigation of the chemistry and engineering of in situ combustion techniques for oil recovery; investigation of the pressure-volume-temperature relationships of hydrocarbons and the use of thermodynamical data in the production techniques.

★ Positions are permanent
★ Excellent working conditions
★ Liberal publication policy
★ New facilities
★ Suburban location
★ Excellent advancement opportunities
★ Salaries open

Apply in writing to: GULF RESEARCH & DEVELOPMENT COMPANY
P. O. Drawer 2038
Pittsburgh 30, Pennsylvania

## AREA ENGINEERS

Several graduate engineers with minimum 5 years' experience supervising maintenance engineering functions in oil refining or producing facilities, power plants, heavy industrial installations, manufacturing plants or related operations. To establish technical supervision, procedures, maintenance operations and schedule routine and special work for major oil producing and refining operation with all supporting facilities; i.e., housing, feeding, recreation, etc.

Salary commensurate with background and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

***Recruiting Supervisor, Box 64***

**ARABIAN AMERICAN OIL COMPANY**

**505 PARK AVENUE**

**NEW YORK 22, NEW YORK**

## HELP WANTED

PETROLEUM ENGINEER, four to six years general field experience, preferably in water-flooding. Location in Southeast Kansas. Replies confidential. Box J-375, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEER—Consulting firm needs an engineer qualified to make complete reservoir studies and prepare evaluation reports. Initial application should list past experience and educational background in detail. Salary requirement should be included. Box J-360, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEER, four to six years experience with emphasis on planning, designing and directing water flood operations, wanted by strong, expanding independent oil company. Submit complete resume of experience, education, photograph, and salary requirements. Replies will be held confidential. Location Oklahoma City. Box J-349, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED NATURAL GAS engineers or petroleum engineers with natural gas experience needed by oil company with expanding gas operations. Minimum of 4 years necessary. Applicants should submit resume of education, experience and state salary expected. All applications treated confidentially. Box J-385, The Oil and Gas Journal, Tulsa, Oklahoma.

**Reservoir Engineer**

**For Work on De Mares Concession, Colombia.**

Experienced graduate engineer capable of estimating oil and gas reserves.

**BOX J-394,**
**THE OIL AND GAS JOURNAL,**
**TULSA, OKLAHOMA.**

**WANTED**

**SUBSURFACE GEOLOGIST**

**Experienced Graduate Geologist**

**PIPE LINE ENGINEER**

**Experienced Graduate Engineer for work on products pipe line now in operation.**

**Positions are in Colombia (De Mares Concession)**

**Box J-358,**
**The Oil and Gas Journal,**
**Tulsa, Oklahoma.**

## SITUATIONS WANTED

SUBSURFACE GEOLOGIST—M.S., 3 years domestic experience with major. Desires position with oil company operating in European-Mediterranean area or Cuba. Presently employed. Box J-365, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM ENGINEER 32, married, family. Seven years major company experience. Workovers, well completions and all phases of waterflooding. Employed. Box J-338, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOGRAPH Supervisor over twenty years wide areal experience all phases operations and interpretation, employed, seeking situation with greater permanency major oil company or stable independent Box J-322, The Oil and Gas Journal, Tulsa Oklahoma.

GEOPHYSICIST, eight years experience considerable review, supervisory work with major, desires permanent location in north Texas or Oklahoma with major or independent. Box J-371, The Oil and Gas Journal, Tulsa, Oklahoma.

**Young man, married, desires to represent company serving oil industry. Five years selling to oil industry, three years engineering in hydraulic equipment, three years on geophysical party for oil company. B.S. in petroleum engineering.**

**BOX J-376,**
**THE OIL AND GAS JOURNAL,**
**TULSA, OKLAHOMA.**

## SITUATIONS WANTED

GEOLOGICAL ENGINEER—38, registered fourteen years Midcontinent experience Desires employment with sound oil or uranium company. Box J-340, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING & PRODUCTION Superintendent, with 20 years diversified experience throughout Mid-Continent Division, desires change. Age 43. Can furnish top references. Box J-367, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 46, Master's, nineteen years experience all phases of industry with both majors and independents, mainly on Gulf Coast, but also familiar with other areas. Box J-390, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-GEOPHYSICIST — B.S. in Geology. Fourteen years of geophysical experience including supervision and 1 year of sub-surface geology. Desire permanent position with reliable company. Box J-382, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT AND MATERIALS Engineer. ME graduate. 15 years engineering experience. Wide production equipment and materials background. I can put your equipment program on a practical engineering basis and supervise engineering practices for procurement. If your equipment purchases are as much as $150,000 annually, my services will be self supporting. Box J-383, The Oil and Gas Journal, Tulsa, Oklahoma.

TWENTY-SIX YEARS experience various phases of oil industry. Seven years proven ability as toolpusher and production superintendent. Complete knowledge of drill stem testing, completion, workovers. Able to supervise drilling and/or production with contractor or independent. Some leasing experience. Two years college. Non-drinker. Presently engaged in deep drilling in Southern California. Desire to return to Mid-Continent or Gulf Coast area. Available March 15. Address Box J-388, The Oil and Gas Journal, Tulsa, Oklahoma.

**EXPLORATION EXECUTIVE**

Young, aggressive, petroleum engineer-geologist with MBA degree. Experience in Texas and Rocky Mountain areas. Desire a responsible position with major oil company or integrated independent.

**Box J-380, The Oil and Gas Journal, Tulsa, Oklahoma.**

## MAILING LISTS

**MAILING LISTS**

Royalty Investors. Other oil lists. Oil Industry Mailing List Co., 405 Tuloma Bldg., Tulsa, Okla.

## BUSINESS OPPORTUNITIES

INVENTORS ATTENTION! . . . Established California firm desires to manufacture on royalty or license basis, metal products selling to oil refineries and chemical plants—or will purchase outright. Box J-378, The Oil and Gas Journal, Tulsa, Oklahoma.

AS AN ENGINEER I am constantly contacting owners of oil and gas properties for sale. Have some excellent deals now in East Texas and Louisiana. Taylor Suite, 618 Kilgore Hotel, Kilgore, Texas.

**Petroleum Service Management Company, Inc.**

*Consulting Engineers and Geologists*

**Research, Evaluations, Bank Loan Reports, Investigations, Reports for Underwriting Issues, Well Supervision, Property Management, Contract Leasing, Drilling Deal Recommendations, Purchase of Proven Oil and Gas Properties. Complete management and supervision, U.S.A.-Foreign Refinery Design, Construction and Management. We handle all of your operations on straight retainer and management fee basis, or participating and retainer basis. 306 Commerce Building, Box 1992, Abilene, Texas. Phone 2-9621.**

## NOTICE

$200.00 REWARD for the return of 1—Johnson-Fagg 2 ring dynomometer used for weighing Sucker Rod loads in Oil Wells, stolen 12-22-55, in or near Wichita, Kansas. Serial #55-198 with rings #24-299 and #48-298 in black vulconized fibre carrying case, with plated metal trim and leather handle. Size 16" x 13" x 8½". Notify American Mfg. Co. of Texas, 307 Mayo Building, Tulsa, Oklahoma—GIbson 7-8785.

## ROYALTIES

OFFERING CHOICE PRODUCING oil and gas income royalties with large reserves per Dollar investments. A. S. Berry, P. O. Box 1383, Tulsa, Okla.

## LEASE AND DRILLING BLOCKS

CONTACT A L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Production.

WANTED—Farm out or acreage to drill on in western part of Kentucky. Box J-356, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL SELL—197 acre lease with 3 producing wells in Washington County, Oklahoma. $10,500.00. 80 acre lease with 2 producing wells in Greenwood County, Kansas. $15,000.00. RR #2, Box 253, Caney, Kansas. Phone 422.

ATTRACTIVE, high potential Oil Drilling deal offered in new mid-continent oil field. Ground Floor Interests available. An oil man's proposition. Not a promotion. Lone Star Petroleum Corporation, 2113 Roosevelt Avenue, Fort Worth 6, Texas.

FOR SALE: Three year option on 33,000 acre block in T 11 & 12 S, R 94 W, Delta Co., Colo. $2.50 & 2½% ORR. Good gas possibilities. Box J-379, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 38 Uranium claims Gardner Basin, Colorado. Surface ore; commercial assay. $1,000 per claim and 10% royalty. Write Grover C. Zweifel, 1724 North Market, Shawnee, Oklahoma.

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**All replies strictly confidential.**

Box J-346,

The Oil and Gas Journal,
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Bernard R. Molitor has been appointed sales representative in the Pittsburgh district by Jackson Kemper, vice president and general manager of W-S Fittings Division, H. K. Porter Co., Inc.

Molitor joined the division's sales department in 1950 and served 4 years in the home sales office at Roselle, N. J. From March 1954 until his recent appointment, he was a salesman in the St. Louis area, serving under Carl Siebert, district manager.

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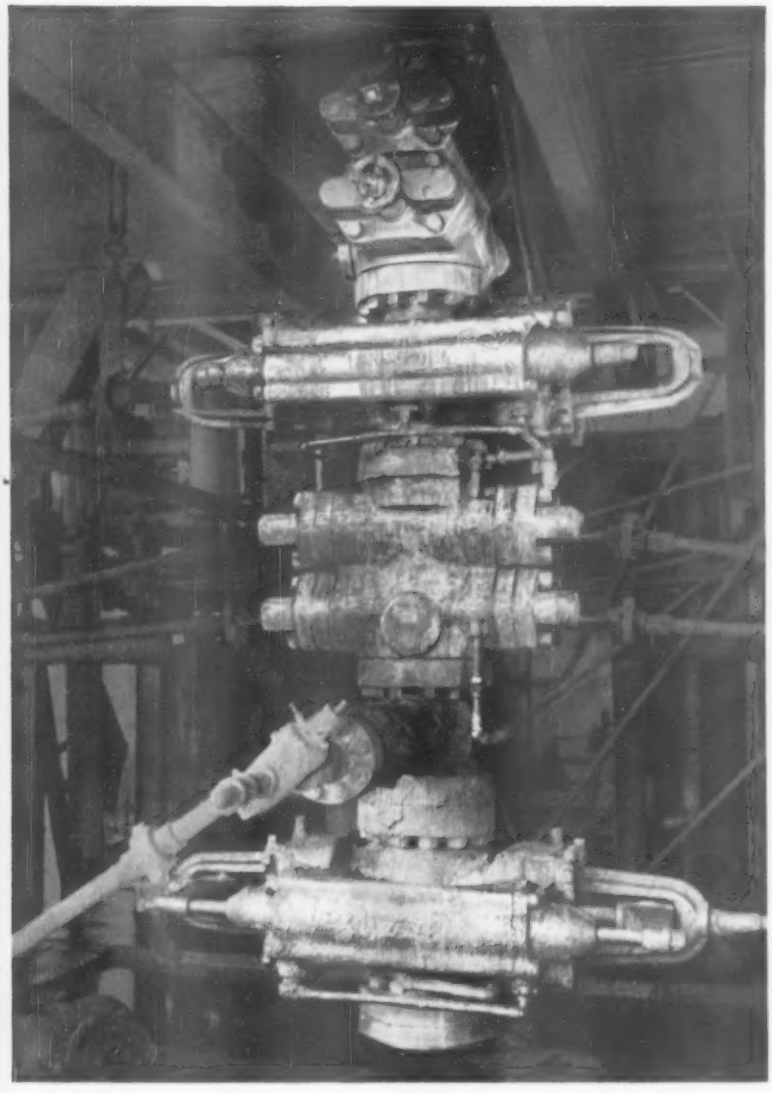

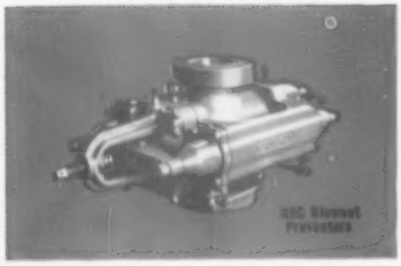

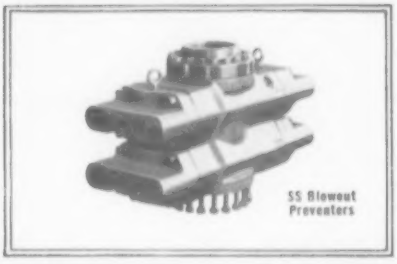

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